The global financial crisis and remittances

What past evidence suggests

Massimilano Calì with Salvatore Dell'Erba

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Massimiliano Calì with Salvatore Dell'Erba[1]

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Overseas Development Institute
111 Westminster Bridge Road
London SE1 7JD

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Acronyms

BoP	Balance of Payments
DFID	Department for International Development
EAP	East Asian and Pacific
ECA	Europe and Central Asia
GDP	Gross Domestic Product
HIC	High Income Country
IFS	International Finance Statistics
IMF	International Monetary Fund
IV	Instrumental Variable
LAC	Latin America and Caribbean
MNA	Middle East and North Africa
NEO	Net Errors and Omissions
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
SAS	South Asia
SSA	Sub-Saharan Africa
UMC	Upper and Middle Income Countries
UN	United Nations
UN DESA	UN Department of Economic and Social Affairs
US	United States
WDI	World Development Indicators

Abstract

There is a heated debate on the effects of the current global financial crisis on remittances to developing countries. Current estimates of the effects rely on questionable assumptions and are not well suited to predict changes in inflows to individual developing countries following the crisis. By specifying a model of remittance outflows' determinants, and by using information on past systemic banking crises, we identify possible effects of the current crisis on total remittances to developing countries. On the basis of this, and of a model of remittance inflows, we estimate that remittances to developing countries could drop by between $25 and $67 billion in 2009. Such drops are slightly larger than those estimated by the World Bank. We also predict the possible changes in inflows for individual developing regions. The regions that seem more likely to be affected by the crisis are Latin America and Caribbean and East Asia and the Pacific, given their relatively higher share of remittances received from high income countries, which are being more negatively affected by the crisis.

1. Introduction

There is currently a great deal of debate on how the global financial crisis will affect remittances to developing countries. This debate has significant developmental implications, as remittances are an important source of external capital for many developing countries and have substantial poverty-reducing effects on sending households (and beyond) – see, among others, Adams and Page (2003) and World Bank (2006). Based on a rough estimation of past crises, Calì et al. (2008) suggest that the current crisis may lead to a possible drop in remittances to developing countries of close to $40 billion (or 20% of the 2007 north to south flow of remittances). Using different methods and assumptions, the World Bank (Ratha, et al., 2008) estimates a much lower drop in remittances to developing countries (between $3 and $16 billion in 2009). This estimate is based on the (rather weak) assumption of a constant share of remittance over gross domestic product (GDP) in the sending countries.

Owing to the importance of remittances for development, it is important to develop more precise estimates of the likely impact of the crisis on total remittances as well as on remittances to individual developing countries. This research proposes to fill the gap by specifying a more complete model of remittances than in previous panel data analyses. This would make it possible to assess the extent to which similar crises have affected remittances outflows in the past. On the basis of these estimates, and of a model of remittance inflows, we also provide estimates of the potential impact of the crisis on individual developing countries.

This paper is divided into six parts. Section 2 details the ways in which the crisis can affect net migration and remittance inflows and outflows. Section 3 describes the methodology to quantify the effects for both remittance inflows and outflows. Section 4 presents the results of the estimation, and Section 5 uses these results to predict changes in total remittance flows as well as in remittance inflows to developing countries' regions. Section 6 concludes briefly, describing how these remittance effects may affect development and growth-related indicators.

2. What impact should we expect on migration and remittances?

The current crisis is likely to reduce the flows of migrants from developing countries, especially to developed countries. Economic theory suggests that migration is driven by the difference between the expected wage obtained in the destination country and the actual wage earned in the source country. According to current forecasts (IMF, 2009b), the crisis is likely to squeeze this difference and reduce the level of migrant flows, as it will hit developed economies harder than developing and emerging ones. The migration stock may also be affected, in that some migrants may lose their job and not be able to find another one, thus increasing the rate of return migration. This reducing impact is likely to vary from country to country according to a number of factors, such as the distribution of migrants across sectors, skills levels of migrants, etc.

Changes in migration patterns and in employment opportunities in destination countries also influence the level of remittances sent back to the country of origin. This is one of the largest sources of external capital for many developing countries, estimated by the World Bank at $265 billion worldwide in 2007 (Ratha et al., 2008).

It is possible to express the total value of remittances sent from country *i* as:

$$R_{it} = Mig_{it} \times r_{it} \qquad (1)$$

where Mig_{it} is the number of migrants in country i remitting at time t, r_{it} is the value per remitter from i. Expression (1) can be re-written in dynamic terms as:

$$R_{it} = Mig_{it-1} \times r_{it}^{t-1} - Mig_{i\Delta t}^{-} \times r_{it}^{t-1} + Mig_{i\Delta t}^{+} \times r_{i\Delta t} \qquad (1')$$

where r_{it}^{t-1} is the average value of remittance at time t for those who were remitting at time t-1; $Mig_{i\Delta t}^{-}$ is the number of old remitters that stopped remitting between t-1 and t; $Mig_{i\Delta t}^{+}$ is the number of new remitters between t-1 and t; and $r_{i\Delta t}$ is the average value of remittances of new remitters.

The financial crisis is likely to reduce the growth of total remittances as it could diminish each positive term in the equation (1') and increase the negative term (as explained above).[2] If large enough, it could even decrease the *absolute* level of remittances, with $R_{it} < R_{it-1}$. Whether these effects of the crisis will be displayed through the influence on observable variables only (e.g. by affecting GDP and unemployment of the host economy) or through independent channels as well (e.g. migrants are hit disproportionately harder as they tend to be a marginal labour force) is an empirical matter, to be explored in the empirical analysis.

Recent evidence suggests that this decrease in remittances may be substantial for certain countries. For example, in the first eight months of 2008, remittances to Mexico (which rely almost exclusively on the US market) decreased by 3.6% (at annual level). In January, the figure fell by 11.88% on a yearly basis. In Honduras, year-on-year remittances declined by 4.5% in October 2008 (IMF, 2009a); in Bolivia, year-on-year decline was 5.3% percent in December 2008 (data from the central bank).

The counterpart of equation (1') is one where country *i* is the receiving country (home) and R_{it} is the value of total remittances inflows to *i*. This version of equation (1') has been the focus of most empirical studies in search of the determinants of remittances. Such studies include (almost exclusively) home country characteristics as determinants of remittance inflows. However, the remittance outflows

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[2] This type of argument finds some indirect empirical support in recent work by Freund and Spatafora (2008), who find a substantial positive impact of GDP per capita of the main host country on the level of remittances sent to the home economy.

equation is probably more apt to identify the impact of the crisis on remittances, as it is able to isolate the effects of the crisis directly on remittances sent by a specific country.

In order to assess the likely effects of the crisis on remittances, this paper estimates a model of remittance determination drawing on the available literature. As mentioned above, recent empirical studies on the determinants of remittances have used mainly inflows data (focusing on the recipient countries). Niimi et al. (2008) provide a micro model of remittances' determination, predicting the impact of a number of variables in remittance-receiving countries (e.g. level of education of the migrant population, financial development in receiving countries, GDP in receiving countries) on the share of remittances in the home country's GDP. They test their predictions using a fairly parsimonious specification on the basis of a cross-section of countries for the year 2000. They find that remittances increase with source countries' level and rate of migration, financial sector development and population, and decrease with these countries' income and the share of migrants with tertiary education.

A more complete empirical specification is provided by Adams (2009), who tests for a larger number of remittances' (per capita) determinants in a cross-section of 62 developing countries. His results are in line with those by Niimi et al. (2008). In addition, he finds that the level of poverty in home countries does not have a positive impact on remittances per capita, whereas the opposite is true for home countries' real interest rate. One problem with these types of analyses is that their cross-section nature does not allow controlling for time-invariant countries' differences, nor a disentangling of the time-varying effects of the changes in remittances' determinants. Moreover, the use of many regressors with a relatively small cross-section of countries leaves limited degrees of freedom, so casting doubts on the reliability of the coefficients.

Freund and Spatafora (2008) is the only paper we are aware of that uses a fairly large panel dataset to analyse the determinants of remittances to developing countries. They are able to control for countries' time-invariant effects and find that the number of emigrants, financial development of home countries and domestic and main host income per capita are all important determinants of remittance inflows. Although the results seem to be quite robust, they are based almost exclusively on the home country's characteristics. Moreover, the only host country variable they use – income per capita – is quite imprecise, is based only on the major destination country for emigrants from the receiving country.

A different type of approach is followed by another line of literature which takes into account both host and home countries' characteristics, using mainly their variation over time to identify their effects on remittances. El-Sakka and McNabb (1999) analyse the determinants of remittances inflows into Egypt between 1967 and 1991. They find that remittances are positively affected by host country's income and negatively affected by the differential between the official and black market exchange rates (as migrants divert their remittances towards the black market when differentials increase).

Vargas-Silva and Huang (2005) also test both home and host country economic factors in influencing remittances using US remittance outflows and remittances sent from the US to Mexico. They find that remittances are more responsive to changes in the macroeconomic conditions of the host country (such as income) than to changes in the macroeconomic conditions of the home country.

El Mouhoub et al. (2005) employ separate error correction models for five southern and eastern Mediterranean remittance-receiving countries. These models test for the short-term relation between remittances and their standard determinants (e.g. income levels, relative prices, exchange rates and their changes). Their findings point towards a heterogeneity across countries in the factors affecting remittances.

We aim to build on and improve the previous literature in a number of ways. First, we use both remittance outflows and inflows for a large panel of countries. Second, we compute quite a complete set of both host and home countries' variables using weights based on migrants' stocks. Third, we test specifically for the impact of previous systemic banking crises on remittance outflows.

3. Empirical methods

As our main interest is to estimate the effects of the crisis on remittances, we employ an original model explaining remittance outflows. We combine this analysis with a remittance inflows' model. This is for three reasons. First, it makes the results of the analysis more comparable with previous studies that focus mainly on inflows of remittances. Second, it serves as a robustness check for the outflows analysis, along which it provides a range of estimated values on the effects of the crisis on remittances. Third, it provides the basis for the estimation of the expected impact of the crisis on individual countries' inflows of remittances (as explained below).

3.1   Remittance outflows

The main aim of the outflows' analysis is to provide a quantifiable measure of the effects of past domestic financial crises on the remittance outflows of the crisis-hit country. In particular, an interesting question concerns whether the crisis has an impact only through changes in incomes of sending and receiving countries, or through other channels as well (which would be the case if, for instance, migrants' earning opportunities were hit differently by the crisis than those of the rest of the population).

The identification of relevant past (domestic) crises is based on recent work by Laeven and Valencia (2008), which identifies countries hit by large systemic banking crises in the past 30 years (along with the relative duration). We believe that using data on systemic banking crises may help us shed some light on the extent to which the current crisis will affect remittances. An objection to this approach is that in fact it is the general economic slowdown brought about by the crisis rather than the actual crisis itself that may affect remittances. As such, we need to measure the effects of past slowdowns rather than those of past crises.

There are two reasons why we think it may still be useful to employ data on past banking crises. First, we already control for eventual economic slowdowns through real economy variables, such as GDP and unemployment. However, a systemic banking crisis represents a particularly severe shock to the economy, one which may not be adequately captured by real economy variables. During (and in the aftermath of) such a shock, marginal workers in the economy, such as immigrants, may be hit particularly severely. This could be a result, for instance, of a rise in labour protectionism, which becomes more popular in times of crises, or the abrupt decline in the demand for services that are relatively abundant in unskilled (often immigrant) labour, such as construction and retail. Second, the database on past banking crises is the only one we are aware of that identifies these types of shocks. As all of the systemic banking crises have generated a sudden economic slowdown, the use of these data is a systematic way to test for the independent effects of sudden slowdowns on remittances.

We test for the determinants of outflows in a sample of 34 high income countries (HIC), as well as in an extended sample that in addition includes 25 upper and middle income countries (UMC). The basic specification is as follows:

$$Rout_{jt} = a_j + b_1 Mig_{jt} + b_2 GDP_{jt}^{HOME} + b_3 GDP_{jt} + b_4 \Delta crisis + \Gamma X_{jt} + K Z_{jt}^{HOME} + c_t + u_{jt} \qquad (2)$$

where $Rout$ is the log of remittance outflow from country j at time t; Mig is the (log of) stock of immigrant population in j at time t; GDP^{HOME} is the (log of) average real GDP of home countries, with each country weighted by its share in total immigrants in j; $crisis$ is a dummy variable with the value of 1 for each year in which the crisis has affected country j (to test whether the crisis affects remittances through channels other than the explanatory variables such as GDP); X is a vector of other characteristics of host country j including inflation, exchange rate, population, real interest and unemployment; Z^{HOME} is a vector of other home countries covariates (including inflation and exchange rate); and a and c are country and time effects.

Equation (2) is a reduced form empirical implementation of equation (1). In particular, we do not observe actual annual changes in the stock of remitters, nor in the average amounts that new and old migrants remit. We proxy the number of remitters through the stock of immigrants and impose a geometric progression to compute the yearly levels of the stock using quinquennial data on immigrants' stock from UN population statistics (see Annex for a description of the interpolation procedure). By assuming constant changes between years we are not able to capture the short-term dynamics in actual migration stocks that are present in (1), but this is the best the data allow us to do. Moreover, as migrants' stocks are quite persistent over time, this assumption should importantly not undermine the quality of our results. We also use the share of females in the immigrant population to check for eventual different remitting behaviour along the gender dimension.

The set of other controls includes a number of variables that are likely to affect the amount remitted (as well as the probability to remit). Let us examine the way in which these effects may work, starting from the *host country* variables (vector X). Inflation may influence outflows through different channels. First, by increasing the general level of prices, it may reduce the migrants' level of savings (and thus the available basis for remittances). Second, to the extent that wages are indexed to the level of prices, inflation could increase nominal wages and thus the amount remitted. These two channels work in opposite directions and thus the expected influence of inflation is ambiguous. The host country exchange rate (vis-à-vis the US dollar) is expected to have a negative effect on outflows, as an appreciating local currency (i.e. decreasing value of the exchange rate) should be associated with higher outflows expressed in dollars. Larger host country population, when controlling for GDP, should be associated with lower outflows, as this would be capturing the effect of GDP per capita: higher population (for any given level of GDP) implies lower GDP per capita, and thus lower remittances. As the real interest rate in the host country represents the opportunity cost for migrants to remit their savings to their country of origin, a higher interest rate should lower the remittance outflows, other things being equal. To the extent that the unemployment rate represents a good proxy for labour market conditions, an increasing rate should indicate poorer work possibilities for migrants and should thus be associated with lower remittances. Net errors and omissions (NEO) from the balance of payments captures the idea that recorded remittances may increase owing to a move out of informal channels, which would imply that NEO would decline as recorded remittances rise (Freund and Spatafora, 2008).

On the home country side, we are not able to use the full set of control variables owing to missing data. The sign of these variables should be the opposite of that of home country variables, as they capture the counterpart effect on remittances. We are able to include inflation and nominal exchange rate, which are computed as weighted averages with the same weights used for GDP^{HOME}. All the variables along with their description and data source are listed in the Annex.

It is worth highlighting that we use these controls mainly as a robustness check for the main coefficients of interest – GDP and migration stock – rather than for estimation purposes. This is for two reasons. First, reliable forecasts for the control variables are not available. For example, what would be the forecast exchange rate between the US dollar and any basket of other currencies for 2009? Second, and importantly, we believe that the GDP-remittance elasticity would capture a sizable part of the effect of the crisis on remittances via observable economic variables. To anticipate our findings, this is confirmed in the relative magnitude of the estimated coefficients.

The bottom line is that, for estimation purposes, we are not interested in the coefficients of the control variables (the column vectors Γ and K). The main coefficients of interest are b_3 and b_4 with the hypothesis being that $b_3>0$ and possibly $b_4<0$. On the basis of these estimated coefficients and of the growth projections for 2008, 2009 and 2010, we are able to provide an estimation of the likely impact of the crisis on global remittance flows. In particular the estimated level of remittances to developing countries for year t would be (with $t \in [2008 , 2010]$):

$$\hat{Rout}_t = Rout_{t-1}(1 + \hat{b}_3 \times \Delta GDP_t^{HIC} + \hat{b}_4) \qquad\qquad (3)$$

where ΔGDP^{HIC} is the forecasted GDP growth between year *t-1* and *t*.

3.2   Remittance inflows

It is possible to predict the extent to which remittance inflow into countries may be hit by the crisis on the basis of a few characteristics of their migrant population. First, certain sectors may be affected less than others. The health sector is likely to be among those. As a primary need, the demand for health services has a low elasticity with respect to income. Therefore, health expenditures may remain fairly stable even in a period of deep crisis. A corollary of this is that remittances to countries whose migrants are particularly concentrated in such sectors may be relatively little affected by the crisis.[3] Second, to the extent that the crisis is localised to certain regions, the more concentrated a country's migrant population is in those regions the more adverse the potential consequences of the crisis on remittance inflows. Data on bilateral migrants' stock (e.g. Parsons et al., 2007) could help make such an assessment for individual countries. Third, the size of remittances relative to a country's economy may determine the potential importance of the effects of the crisis via this channel. The more reliant a country is on remittances to fund its imports or its public budget, the more exposed it is to the potential reduction in remittances. Table 1 presents a list of the largest remittance-dependent countries. It is important to bear in mind the potential limitations of relying on official statistics to record remittances inflows. In fact, the World Bank estimates that around 50% of recorded remittances are sent through informal channels. It is not clear whether this figure may change in time of crisis, but some caution is needed in interpreting the results of the impact on recorded remittances. We will use some of this information, wherever available, to make predictions on the effects of the crisis on individual countries.

Table 1: Remittances to remittance-dependent countries, 2004-2008 (US$m)

	Region	2004	2005	2006	2007	2008[e]	Share in GDP (% 2007)
Tajikistan	ECA	252	467	1019	1691	1750	45.5
Moldova	ECA	705	920	1182	1498	1550	38.3
Lesotho	SSA	355	327	361	443	443	28.7
Honduras	LAC	1175	1821	2391	2625	2820	24.5
Lebanon	MNA	5591	4924	5202	5769	6000	24.4
Guyana	LAC	153	201	218	278	278	23.5
Jordan	MNA	2330	2500	2883	3434	3434	22.7
Haiti	LAC	932	985	1063	1222	1300	20.0
Jamaica	LAC	1623	1784	1946	2144	2144	19.4
Kyrgyz Republic	ECA	189	322	481	715	715	19.0
El Salvador	LAC	2564	3030	3485	3711	3881	18.4
Nepal	SAS	823	1212	1453	1734	2254	15.5
Armenia	ECA	813	940	1175	1273	1300	13.5
Nicaragua	LAC	519	616	698	740	771	12.1
Philippines	EAP	11,471	13,566	15,251	16,291	18,669	11.6
Guatemala	LAC	2627	3067	3700	4254	4472	10.6
Albania	ECA	1161	1,290	1359	1,071	1071	10.1
Bangladesh	SAS	3584	4314	5428	6562	8893	9.5
Sierra Leone	SSA	25	2	50	148	150	9.4
Dominican Republic	LAC	2501	2719	3084	3414	3575	9.3
Cape Verde	SSA	113	137	137	139	139	9.2
Morocco	MNA	4221	4590	5451	6730	6730	9.0
Senegal	SSA	633	789	925	925	1000	8.5
Togo	SSA	179	193	229	229	229	8.4
Guinea-Bissau	SSA	28	28	28	29	30	8.3
Sri Lanka	SAS	1590	1991	2185	2527	2720	8.1
Dominica	LAC	23	25	25	26	30	8.0
Vietnam	EAP	3200	4000	4800	5500	5500	7.9
Uganda	SSA	311	323	665	849	875	7.2

Note: Estimates based on data until October 2008. ECA = Europe and Central Asia; LAC = Latin America and Caribbean; MNA = Middle East and North Africa; SAS = South Asia; SSA = Sub-Saharan Africa.
Source: World Bank (2009) based on IMF Balance of Payment Statistics.

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[3] This seems to be the case of Philippines, according to the central bank: inflow of remittances is not expected to slow down significantly in the aftermath of the current crisis (see http://www.gmanews.tv/story/125211/US-crisis-will-have-little-effect-on-remittances). The small effect on the Philippines is confirmed by World Bank estimates reported in Table 2.

We propose to extend the previous work on the determinants of outflows of remittances by using panel data of countries with more information on the composition of migrants' population than in previous literature (using a recent dataset from Docquier et al., 2007). The data on migrants' characteristics are available for the years 1990 and 2000 and could be interpolated (between the two years) to extend the coverage of the analysis. In particular, the basic specification is the counterpart of specification (2) and assumes the following form:

$$R\inf_{it} = \alpha_i + \beta_1 Mig_{it} + \beta_2 GDP_{it}^{HOST} + \beta_3 GDP_{it} + \Gamma X_{it} + K Z_{it}^{HOST} + \delta_t + \varepsilon_{it} \qquad (4)$$

where $Rinf$ is the log of remittance inflows towards country i at time t, Mig is the stock of emigrants from I; GDP^{HOST} is the average GDP per capita of host countries, with each country weighted by its share (in 2000) in total migrants from i; X is a vector of country i characteristics including migrants' characteristics, exchange rate, inflation and real interest; Z^{HOST} is a vector of other covariates of host countries (with the same weights as per GDP^{HOST}); and α and δ are country and time effects. A key outcome of this analysis should be to identify the elasticity of remittances with respect to GDP^{HOST}. We would expect this elasticity $\beta_2 > 0$ (and possibly not far from b_2). Note that this type of specification is not suitable to capture the independent impact (i.e. via other variables than the economic ones) of the crisis on remittances. A crisis variable would need to be constructed as a weighted average of dummies using the same weights as per GDP^{HOST}. This implies that its variation would be very limited, as the variable would be mostly zero and otherwise very close to zero.[4]

For consistency, we try to keep the sets of controls as close as possible to those employed in the outflow regressions. However, owing to data limitations, we can replicate them only partially. In particular among the host countries (which are now weighted averages), the controls we are able to include are exchange rate and inflation; among the home country controls, we include inflation, exchange rate and population.

Again on the basis of the host country GDP-remittances elasticity, we can estimate the overall impact of the crisis on remittances towards developing countries.

$$\hat{R}\inf_t = R\inf_{t-1}(1 + \gamma\hat{\beta}_2\Delta GDP_t^{HIC} + (1-\gamma)\hat{\beta}_2\Delta GDP_t^{DC}) \qquad (5)$$

where ΔGDP_t^X is the expected growth rate between t-1 and t of X countries (where X is high income or developing countries) and γ is the share of total remittances from high income countries.

We also estimate the effects of the crisis on inflows into individual regions. The estimated remittance inflow for region i at time t can be computed as:

$$\hat{R}\inf_{it} = R\inf_{it-1}(1 + \gamma_i\hat{\beta}\Delta GDP_t^{HIC} + (1-\gamma_i)\hat{\beta}\Delta GDP_t^{DC}) \qquad (6)$$

where $\hat{\beta}_2$ is the estimated elasticity of remittance inflows to income of the host countries, γ_i is the region specific share of remittances received from high income countries of developing countries, a number based on estimates by the World Bank (2009).

3.3   Data

Unlike migration flows, remittance flows are recorded systematically by central banks in balance of payments (BoP) statistics. In particular, the World Bank argues that the most accurate representation of remittance inflows is provided by the sum of three items in the BoP:

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[4] This owes to the fact that only a handful of remittance-sending countries have experienced a systemic banking crisis in the period considered and these generally represent a modest share in the total emigrants' stock (which is the basis for calculating the weights).

i) 'Workers' remittances' recorded under the heading 'current transfers' in the current account (item code 2391 in the IMF's BoP yearbook);

ii) 'Compensation of employees', which includes wages, salaries and other benefits of border, seasonal and other non-resident workers (such as local staff of embassies) and which are recorded under the 'income' subcategory of the current account (item code 2310); and

iii) 'Migrants' transfers', which are reported under 'capital transfers' in the capital account (item code 2431).

This broader definition is believed to capture the extent of workers' remittances better than the data reported under the 'workers' remittances' heading alone (see Ratha, 2003, for a discussion). The World Bank uses this definition to compile data on remittance inflows (see Table 1 for a ranking of countries according to their dependence on remittances – measured as a share of GDP – compiled with this data).[5] A common concern with remittances data is the possibility that this data will be measured with error. There are two related types of error. One owes to the large part of remittances sent informally (around 50% of total recorded remittances). This share is likely to vary across countries. The other potential error owes to the changes in the informal/formal share over time. This share is likely to be decreasing. To the extent that the first measurement error varies only across countries, the fixed effects in the regression should absorb it. Time effects should absorb the latter error if its variation is over time. The problem would arise if the measurement error changed simultaneously over time and across countries. In this case, however, it would be reflected in larger error terms, and in higher standard errors of the regressors. But the coefficients – which represent our main interest here – would remain consistent, as the potential measurement error is in the dependent variable.

Another measurement issue, which may be important when comparing the results using remittance outflows with those using inflows, is the difference in the value of remittance inflows and outflows. These two data are captured through different methods by the central banks, as one represents capital inflows and the other is a capital outflow. This turns into a fairly large difference in terms of total value of remittances in the world computed using the two datasets. According to the World Bank (2009), in 2007 this total was equal to $371 billion using the remittance inflows data; it was equal $248 billion using the remittance outflows data. This is a 50% difference, which may suggest a need for some caution when comparing results based on remittance outflows with those based on inflows.

A major focus of this paper is to assess whether there is an independent effect of past financial crises on the flow of remittances from developed countries. Using recent work from Laeven and Valencia (2008), we are able to identify the starting year of a banking crisis in our sample. The authors distinguish between systemic and non-systemic crisis, identifying a systemic crisis as when 'a country's corporate and financial sectors experience a large number of defaults [...] non-performing loans increase sharply and all or most of the aggregate banking system capital is exhausted. [...] In some cases, the crisis is triggered by depositor runs on banks.' Their work updates and extends previous work done by Caprio et al. (2005). In Figure 1, we present the distribution of crises across time periods.

In the original sample, the authors identify 124 systemic crises. After dropping countries for which no observations are available, we are left with 103 episodes.

Our main dependent variables can be classified into two groups: i) immigrants and emigrant characteristics; ii) home and host country macroeconomic conditions. The variables on immigrants stocks, in total and by gender, have been extracted from the World Migrant Stock Database, edited by the Department of Economic and Social Affairs (DESA) of the UN. The data on emigrants' stocks across gender and education have been taken from Docquier et al. (2007), who focus on emigrants' stocks in Organisation for Economic Co-operation and Development (OECD) countries. This original dataset is

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[5] Ideally, these data would need to be evaluated on a monthly basis. Moreover, there may be other determinants that could influence these inflows, such as increased migration restrictions (likely to affect only the number of new remitters in equation 1'). It is more difficult to take into account these simultaneous determinants owing to data limitations, although part of them may a result of the crisis itself.

employed in the estimation of equation (4).[6] For the construction of some variables, in particular the weighted GDP per capita of the home countries in equation (2) and the weighted GDP per capita of the host countries in equation (4), we use the Bilateral Migrants Database by Parsons et al. (2007), which allows us to quantify the share of migrants by destination in the year 2000.

Figure 1: Number of banking crises, 1974-2007
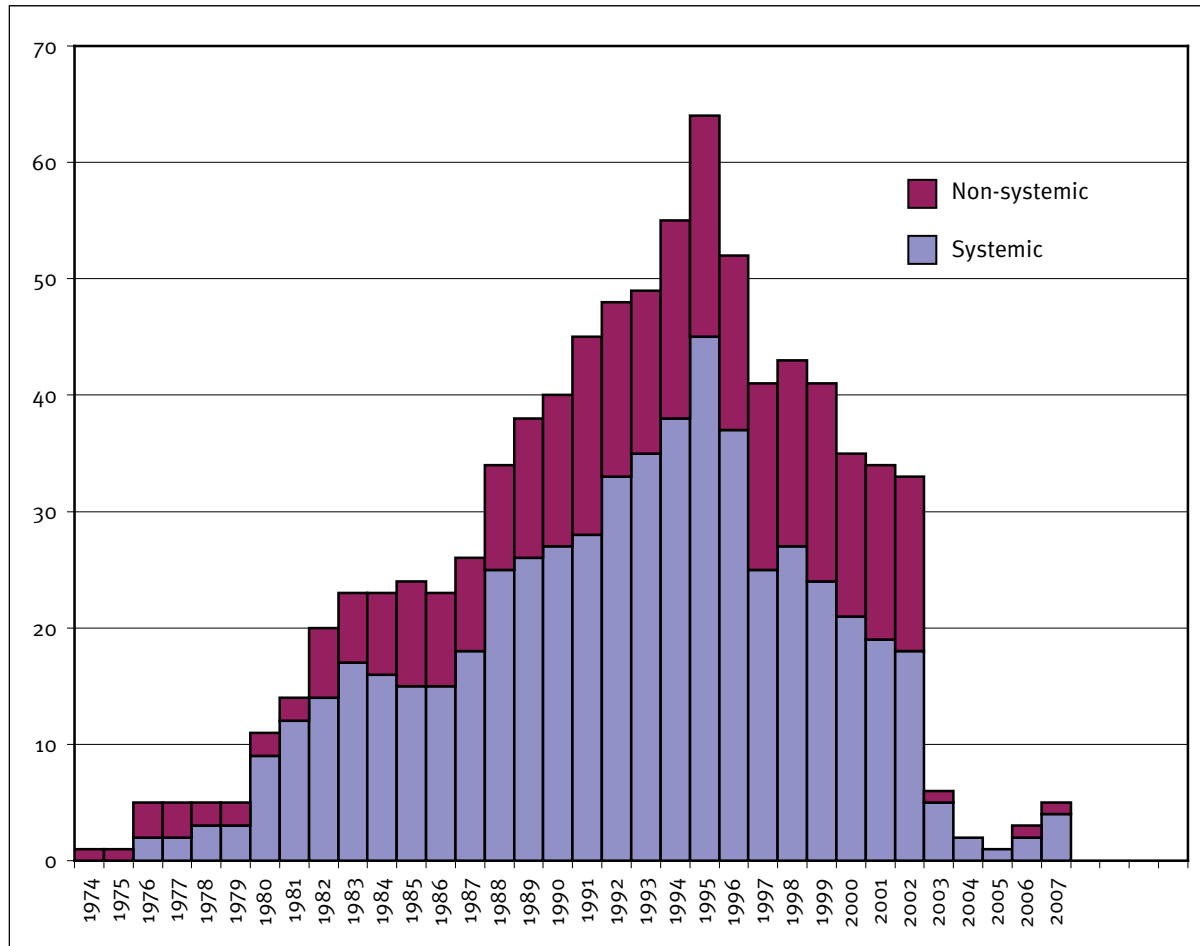
Source: Authors' elaboration on Laeven and Valencia (2008).

Home and host country characteristics include: real GDP; inflation; nominal exchange rate; population; and unemployment rate (%), which we cannot compare across both equation (2) and equation (4) owing to a lack of observations for this variable in many developing countries. The data have been extracted from the World Development Indicators (WDI) Database (2009) compiled by the World Bank.

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[6] The drawback of employing these data is that the focus mainly on north–north, north–south migration, neglecting the rising importance of south–south movements of emigrants. It may thus seriously underreport the stock of emigrants in some developing countries in our sample. As explained in Section 4.2, balancing omitted variables with measurement errors biases, we employ Instrumental Variables (IV) technique using the age dependency ratio. We find the results to be robust.

4. Results

Before presenting the results of the econometrics analyses, we introduce some suggestive graphical evidence of the possible impact of part crises on remittance inflows and outflows.

One way to explore the relationship between crises and remittances is to examine the flow of towards countries whose migrants concentrate in crisis-hit areas. Figure 2 plots the yearly remittance flow towards the East Asian and Pacific (EAP) region over time. As a substantial share of migrants from the region goes to the region itself, remittances towards the EAP were hit at the time of the financial crisis of 1997/98, suffering a substantial dip. In the aftermath of the crisis, in 1998, remittances to the region declined by approximately 15%, which is in line with the impact measured in Table 1 (column 4). However, this decline was short-lived and the long-term trend of remittances does not seem to have been affected. By 1999, remittances in nominal terms were already back at the pre-crisis level.[7]

Figure 2: Remittance inflows to the East Asian region, 1977-2007 (US$'000s current)
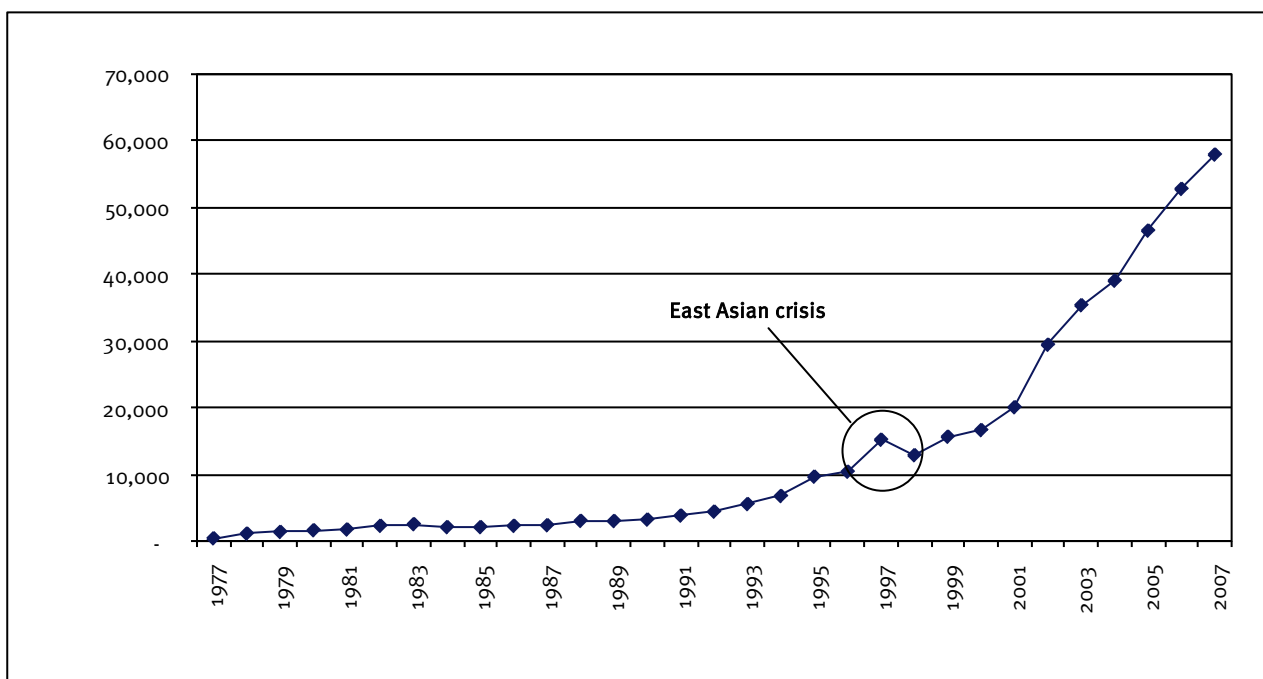
Source: World Bank (2009) based on IMF Balance of Payment Statistics.

But, as expected, confirming the idea that the crisis affects local migrants and local flows of money within the region, remittances towards other developing regions whose emigration was not concentrated in the East Asian regions were not hit by the crisis instead, as suggested in Figure 3. Overall flows to SSA and MNA remained the same, but they kept rising for LAC.

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[7] A caveat in the interpretation of this picture may be the possible effect of domestic currency depreciations, which tend to happen in tandem with crises.

Figure 3: Remittances inflows to developing regions, 1994-2000 (US$m current)
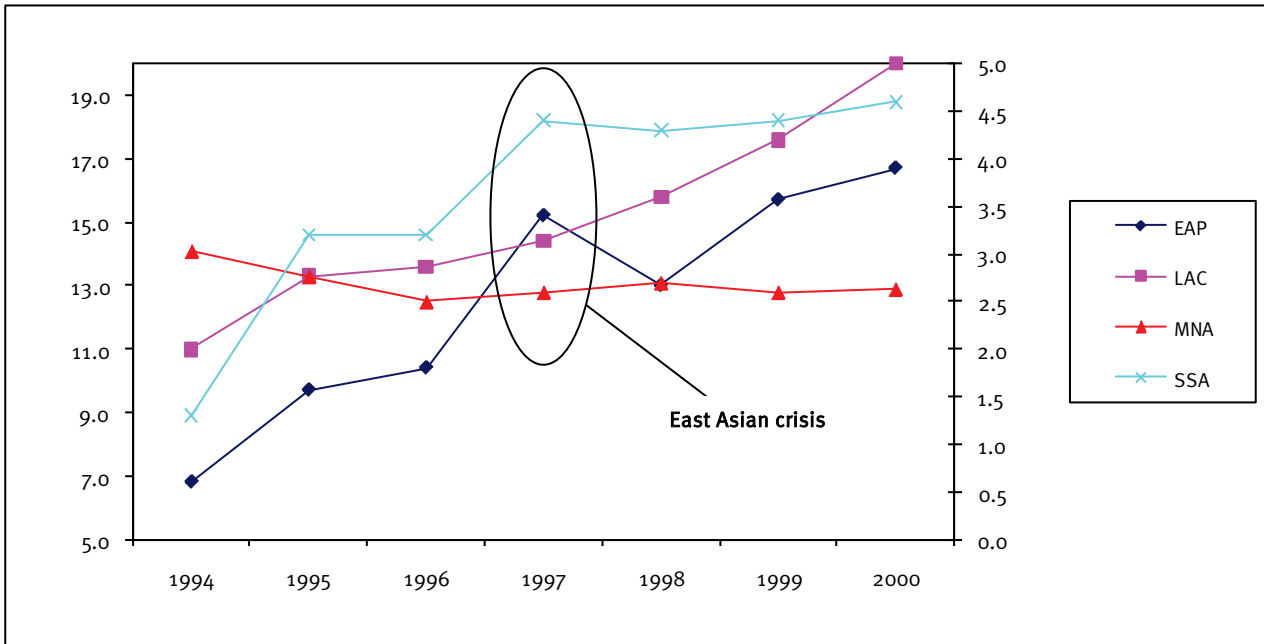
Note: SSA is on the right scale. *Source*: World Bank (2009) based on IMF Balance of Payment Statistics.

Another way of examining the effects of crises on remittances is to look at what happens to remittance outflows in the aftermath of a crisis hitting the remittance-sending country. Figure 4 plots the evolution in remittance outflows in the selected countries that have experienced systemic banking crises. As is evident, most crises' episodes seem to have a substantially negative effect on the subsequent level of remittances. In the majority of the cases this effect is short-lived, and remittances quickly return to their pre-crisis level, but in the case of Sweden and Japan this has not yet been the case.

Figure 4: Remittance outflows in selected countries, 1972-2006
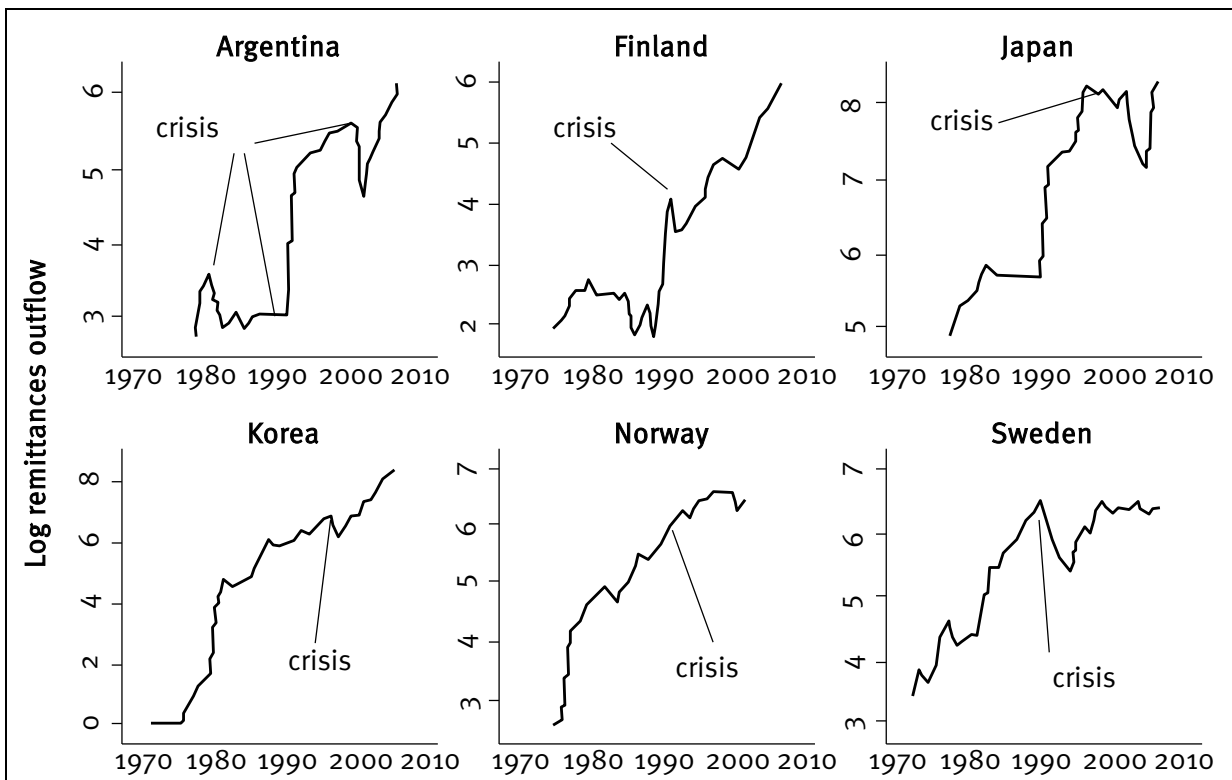
Source: Authors' elaboration on World Bank (2009) and Laeven and Valencia (2008).

The evidence reveals that the crisis seems to be a special time, and there seems to be an effect arising on both inflows and outflows. In the next sections, we will shed light on the quantitative nexus between financial crises and remittances.

4.1   Remittance outflows

Table 2: The effect of the crisis on remittance outflows, 1970-2007

Sample	(1) HIC+UMC Rem out	(2) HIC+UMC Rem out	(3) HIC+UMC Rem out	(4) HIC Rem out	(5) HIC Rem out	(6) HIC Rem out
Real GDP (host)	1.380* (1.71)			1.887** (2.45)		
Stock immigr. (host)	1.357*** (3.73)	1.367*** (3.17)		1.694*** (4.89)	1.791*** (4.06)	
Share fem immigr. (host)	-1.961 (-0.57)	-0.580 (-0.13)		0.203 (0.048)	2.215 (0.37)	
Inflation (host)	0.050 (0.99)			0.003 (0.067)		
Nominal X-rate (host)	0.151 (1.34)			0.248*** (2.87)		
Pop (host)	-1.274 (-0.95)	0.804 (0.48)	0.961 (0.50)	-2.395** (-2.23)	-0.135 (-0.12)	-0.998 (-0.63)
Real interest rate (host)	0.126** (2.54)			0.051 (0.91)		
Unemp. % (host)	0.007 (0.044)			-0.077 (-0.40)		
Errors and omissions	0.984 (0.81)			0.890 (0.72)		
Real GDP (home)	0.689 (0.44)	0.766 (0.55)	-0.498 (-0.30)	0.249 (0.24)	1.395 (1.43)	0.100 (0.074)
Nominal X-rate (home)	0.192 (1.37)	0.211 (1.63)	0.227* (1.88)	-0.001 (-0.0077)	0.062 (0.43)	0.216 (1.44)
Inflation (home)	0.044 (0.46)	0.011 (0.11)	0.013 (0.13)	0.019 (0.21)	0.045 (0.44)	0.042 (0.36)
Crisis	0.017 (0.12)	0.004 (0.027)	-0.075 (-0.34)	-0.041 (-0.27)	-0.160 (-1.18)	-0.295 (-1.03)
Country effects	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES
Observations	752	752	752	526	526	526
Countries	59	59	59	34	34	34
R-sq. (within)	0.616	0.587	0.527	0.752	0.709	0.609

Note: Dependent variable is log of remittance outflows in current US dollars. All variables are in log except crisis. Robust t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2 presents the results of specification (2) for the entire period 1970-2007. The results suggest that the crisis has not had any independent impact on remittance outflows, when including all the control variables for which data are available (columns 1 and 4). We first run the specification for both HIC and UMC (columns 1-3). The most important determinants of outflows appear to be the stock of immigrants in the host country and the real GDP of the host country. This suggests that host country's conditions tend to be more important than home countries' in determining remittance outflows in line with Vargas-Silva and Huang (2005). The elasticity of outflows with respect to these variables is fairly high, between 1.4 (for HIC and UMC) and 1.8 (for HIC) for the immigrants' stock and between 1.4 (for HIC + UMC) and 1.9 (for HIC) for real GDP.

Among the host country's variables, inflation has a positive but insignificant effect on outflows, the exchange rate has a positive and (only for HIC) significant effect, i.e. higher depreciation of the local currency is associated with higher outflows, which is an unexpected result. Larger population is associated with lower outflows only for HIC and when controlling for other host country variables (column 4). The share of females in the immigrant population is not significant (and it is positive for HIC and UMC and negative for HIC). Surprisingly, the real interest rate in the host country has a positive effect on remittances, although it is insignificant when considering only HIC (column 4). This estimation may suffer from an endogeneity bias as the interest in home countries may be affected by remittance receipts.

Finally, the unemployment rate has an insignificant effect on remittances, and NEO from the BoP are positively related with the level of remittances, but the coefficient is not statistically significant. On the other hand, the coefficients of the home country variables are insignificant, except for the nominal exchange rate, which has the expected (mild) positive effect on outflows in the extended sample. The effect of the crisis variable remains insignificant even when we do not control for the other host country controls – see columns 2 and 5, which have the immigrant stock controls, and columns 3 and 6 without them. However, the effect of the variable turns negative (from positive) for the HIC + UMC sample (columns 1-3) and the coefficient becomes more negative for the HIC sample (columns 4-6). This may indicate that part of the effect of the crisis variable may be accounted for by other host country economic conditions.

The surprising results for some of the variables in Table 2 may be explained partly by measurement error in the remittance measure for the early periods. Although remittance data are available from 1970, their coverage and the precision in their collection process have improved over time. This appears to be the case especially for non-HIC. In order to tackle this measurement issue, we run specification (2) only for the post-1990 period. This analysis is also more comparable with that on remittance inflows, which considers the 1990-2000 period.

Table 3: The effect of the crisis on remittance outflows (HIC), 1990-2007

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sample	HIC	HIC	OECD	HIC	HIC	HIC	HIC	HIC	HIC
	Rem out	Rem out	Rem out	Rem out	Rem out	Rem out	Rem out	Rem out	Rem out
Real GDP (host)	1.594** (2.08)	1.593** (2.08)	1.004 (1.19)	1.599** (2.07)	1.599** (2.06)	1.559** (2.05)			
Stock immigr. (host)	0.959*** (2.83)	0.962*** (2.84)	1.312*** (3.46)	0.958*** (2.82)	0.963*** (2.76)	0.958*** (2.75)		1.107*** (3.44)	
Share fem immigr. (host)	3.057 (0.58)	3.145 (0.59)	7.545 (1.09)	3.023 (0.57)	3.075 (0.57)	2.877 (0.53)		5.044 (0.88)	
Inflation (host)	0.014 (0.44)	0.015 (0.45)	0.020 (0.56)	0.014 (0.43)	0.014 (0.43)	0.014 (0.42)			
Nominal X-rate (host)	-0.388 (-1.29)	-0.395 (-1.28)	-0.604 (-1.27)	-0.386 (-1.28)	-0.383 (-1.27)	-0.345 (-1.11)			
Pop (host)	0.075 (0.08)	0.088 (0.09)	0.823 (0.26)	0.069 (0.07)	0.062 (0.06)	0.190 (0.19)	2.015* (1.71)	1.463 (1.43)	2.015* (1.70)
Real interest rate (host)	0.017 (0.31)	0.017 (0.31)	0.015 (0.31)	0.016 (0.30)	0.016 (0.31)	0.009 (0.17)			
Unemp. % (host)	0.782** (2.58)	0.789** (2.55)	0.882** (2.72)	0.789** (2.53)	0.789** (2.51)	0.789** (2.52)			
Unemp. % (host) sq.	-0.190** (-2.73)	-0.191** (-2.72)	-0.214** (-2.26)	-0.191*** (-2.74)	-0.192*** (-2.75)	-0.184** (-2.55)			
Errors and omissions	0.501 (0.83)	0.521 (0.84)	0.608 (0.90)	0.508 (0.83)	0.505 (0.82)	0.537 (0.80)			
Real GDP (home)	1.959** (2.15)	1.962** (2.14)	0.345 (0.19)	2.007* (1.88)	1.994* (1.87)	2.174* (1.99)	1.749* (1.98)	2.693*** (2.82)	1.749* (1.99)
Nominal X-rate (home)	0.172** (2.27)	0.173** (2.26)	0.203** (2.34)	0.173** (2.26)	0.170** (2.15)	0.168** (2.17)	0.233** (2.45)	0.164* (1.95)	0.233** (2.44)
Inflation (home)	-0.010 (-0.15)	-0.010 (-0.14)	0.033 (0.43)	-0.010 (-0.15)	-0.011 (-0.15)	-0.010 (-0.14)	-0.041 (-0.60)	0.010 (0.17)	-0.041 (-0.59)
Crisis	-0.070 (-0.72)	-0.046 (-0.51)	-0.123 (-1.37)	0.203 (0.13)	0.372 (0.21)	3.268 (1.48)	-0.081 (-0.63)	-0.044 (-0.46)	-0.080 (-0.67)
Crisis (t-1)		-0.032 (-0.44)							-0.002 (-0.017)
Real GDP (host) x crisis				-0.011 (-0.19)	-0.016 (-0.25)	-0.105 (-1.37)			
Shr mig. (host) x crisis					-0.320 (-0.18)	-1.230 (-0.70)			
Unemp. % (host) x crisis						-0.290* (-1.96)			
Country effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	353	353	281	353	353	353	353	353	353
Countries	34	34	24	34	34	34	34	34	34
R-sq. (within)	0.588	0.588	0.592	0.588	0.588	0.592	0.501	0.555	0.501

Note: Dependent variable is log of remittance outflows in current US dollars. All variables are in log except crisis. Robust t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Results for the HIC sample are presented in Table 3. Again, real GDP and the stock of immigrants in the host country are among the most relevant explanatory variables. The elasticity of outflows with respect to GDP is around 1.6, slightly below that found for the whole period in Table 2 (column 4), while that of immigrant stock is substantially smaller than for the whole period, at around 1. These elasticities are in line with those found by Freund and Spatafora (2008) using emigrants' stocks, GDP per capita of the main host country and remittance inflows. Almost all the other host country variables have the

expected sign. In particular, the unemployment rate in the host country appears to be another important determinant of remittance outflows, suggesting that this may not be a good proxy to capture immigrants' labour participation. Its effect is highly non-linear: for low levels of unemployment, increases in unemployment raise remittance outflows; as unemployment grows above a certain threshold (around 4.1% of total labour force), then the relation between unemployment and remittance outflows becomes negative. This result suggests that, in economies close to full employment, increases in immigrants (demanded to fill gaps in the local labour force) may be accommodated through increases in unemployment, thus generating a positive relation. However, as unemployment grows, the effect rises in unemployment may be reflected in lower wages (with the effect being particularly high for migrants). The home country variables appear to have a significant effect on remittances, including real GDP (which has a positive coefficient) and the nominal exchange rate (which is negative as expected). The sign of the former variable suggests that remittances tend to be pro-cyclical with the economic cycle, and increase as investment opportunities ameliorate in the home country.

The variable crisis has a negative but not significant effect on remittance outflows for the HIC sample. The one-off reduction in remittances caused by the crisis independently of other economic effects is 7% on average, although with a large standard error (column 1). The coefficient of crisis in column 1 is very similar to that in column 7, which is obtained without including the other host country controls. This suggests that the main effects of the crisis on remittances do not operate through observable economic variables in the host country. The coefficient of crisis is even less negative than in column 1 when including only immigration variables among the host country controls, (col. 8). The independent effect of the crisis operates mainly in the year of the crisis, although it is somewhat present also a year after the end of the crisis (column 2). When restricting the sample to OECD countries the independent impact of the crisis on remittance outflows becomes larger at around 12% – although it is significant only at the 15% level (column 3). This larger effect is associated with a concomitant reduction in the remittance outflows-host country GDP elasticity by about 50%.

The crisis appears to have no differential impact on remittances in those countries with lower GDP (column 4). In the same way, the crisis seems to have no differential impact on remittances in those countries with a higher share of immigrants in total population (column 5). The coefficients of these interactions increase somewhat in magnitude (but they remain insignificant) once we include the interaction between crisis and unemployment in the host country, which has a negative and significant sign (column 6). This indicates that the crisis affects remittances more in those countries with higher unemployment. As well as affecting remittances directly, unemployment influences remittances even more in times of crisis. This may be consistent with the crises displacing immigrants relatively more in those contexts where high unemployment and higher share of immigrants in the population make the local labour force (and thus local policymakers) more concerned about job opportunities available to non-nationals.

Interestingly, these labour market effects seem to be the drivers of the direct impact of the crisis on remittance outflows. In fact, the coefficient of the variable crisis becomes large and positive (but not significant) when adding the unemployment interaction. These results depart substantially from those of the entire sample 1970-2007 presented in Table 2. It is likely that at least part of the explanation for such a difference may lie in the problem of measuring both remittances and the other variables. This problem is likely to be more severe in the early period.[8] However, part of the changes in the coefficients (and in the impact of the crisis) over time may be genuine owing to, for instance, different (unobservable) countries' conditions or differences in the type of crises. We cannot establish the extent to which the differences between the coefficients in Table 2 and 3 are determined by measurement error vs. by different conditions. In any instances, it is reassuring that the main coefficient of interest for the estimation (GDP of the host economy) remains fairly constant over time.

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[8] In order for it to influence the variables' coefficients, the changes in measurement error over time need to vary across countries, which is a plausible hypothesis.

Table 4: The effect of the crisis on remittance outflows (HIC and UMC), 1990-2007

Sample	(1) HIC+UMC Rem out	(2) HIC+UMC Rem out	(3) HIC+UMC Rem out	(4) HIC+UMC Rem out	(5) HIC+UMC Rem out	(6) HIC+UMC Rem out	(7) HIC+UMC Rem out	(8) HIC+UMC Rem out
Real GDP (host)	1.489*	1.547*	1.496*	1.472*	1.518*			
	(1.81)	(1.88)	(1.86)	(1.81)	(1.84)			
Stock immigr. (host)	0.573	0.564	0.563	0.579	0.554		0.809**	
	(1.66)	(1.62)	(1.63)	(1.66)	(1.54)		(2.12)	
Share fem immigr. (host)	1.644	1.368	1.756	1.849	2.181		5.671	
	(0.38)	(0.31)	(0.41)	(0.43)	(0.51)		(1.39)	
Inflation (host)	0.023	0.024	0.026	0.025	0.021			
	(0.56)	(0.59)	(0.63)	(0.61)	(0.52)			
Nominal X-rate (host)	-0.300**	-0.298**	-0.317**	-0.306**	-0.305**			
	(-2.12)	(-2.04)	(-2.20)	(-2.14)	(-2.21)			
Pop (host)	0.763	0.662	0.768	0.778	0.645	2.103	1.333	2.052
	(0.71)	(0.61)	(0.73)	(0.74)	(0.64)	(1.59)	(1.04)	(1.54)
Real interest rate (host)	0.027	0.031	0.025	0.026	0.026			
	(0.61)	(0.68)	(0.57)	(0.60)	(0.59)			
Unemp. % (host)	0.924***	0.899***	0.834***	0.807***	0.806**			
	(2.94)	(2.87)	(2.80)	(2.69)	(2.65)			
Unemp. % (host) sq.	-0.206**	-0.201**	-0.184**	-0.179**	-0.187**			
	(-2.54)	(-2.46)	(-2.37)	(-2.29)	(-2.32)			
Errors and omissions	0.750	0.664	0.706	0.691	0.700			
	(1.23)	(1.12)	(1.19)	(1.15)	(1.21)			
Real GDP (home)	0.779	0.818	0.581	0.485	0.358	1.034	1.823	1.100
	(0.58)	(0.63)	(0.44)	(0.36)	(0.25)	(0.91)	(1.41)	(1.00)
Nominal X-rate (home)	0.153**	0.155**	0.145**	0.138**	0.139**	0.156**	0.186**	0.159**
	(2.29)	(2.33)	(2.16)	(2.04)	(2.04)	(2.12)	(2.59)	(2.16)
Inflation (home)	-0.022	-0.021	-0.027	-0.029	-0.031	-0.057	-0.033	-0.057
	(-0.39)	(-0.38)	(-0.48)	(-0.50)	(-0.52)	(-0.98)	(-0.54)	(-0.98)
Crisis	-0.206*	-0.288**	-2.248	-1.867	-3.391	-0.151	-0.154	-0.215
	(-1.90)	(-2.42)	(-1.58)	(-1.31)	(-1.40)	(-1.16)	(-1.26)	(-1.56)
Crisis (t-1)		0.131						0.102
		(1.28)						(1.10)
Real GDP (host) x crisis			0.081	0.069	0.109			
			(1.51)	(1.28)	(1.44)			
Shr mig. (host) x crisis				-1.236	-1.016			
				(-1.10)	(-0.80)			
Unemp. % (host) x crisis					0.235			
					(0.87)			
Country effects	YES	YES	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	543	543	543	543	543	543	543	543
Countries	59	59	59	59	59	59	59	59
R-sq. (within)	0.474	0.476	0.478	0.478	0.481	0.400	0.429	0.402

Note: Dependent variable is log of remittance outflows in current US dollars. All variables are in log except crisis. Robust t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Most of the results are fairly robust to including also UMC (Table 4). The coefficient of host country's real GDP is very similar to that for HIC only, at around 1.5, which is reassuring, as this elasticity is key to computing the forecasts for remittances. On the other hand, the coefficient for immigration stock is 40%, smaller than for HIC only, and is slightly below the conventional levels of significance. This may suggest that new migrants tend to remit (and possibly earn) less than previous ones. The other control variables maintain the same sign and similar levels of significance, except for a few. The significance of

the nominal exchange rate of the host country increases (maintaining a negative effect); the coefficient (and significance) of real GDP of home countries drops substantially.

More importantly for our study, the independent effect of the crisis on remittances is much larger in this enlarged sample – at around 20% – than for HIC only and is significant at conventional levels. This suggests that the crisis undermines migrants' earning opportunities more in UMC than in HIC. As in the previous table, crisis displays its effects directly rather than via other economic variables (column 1 vs. column 6, which include only immigrants' stocks among host country controls, and column 7, which does not include any host country controls). The lagged effect of the crisis is positive and increases the magnitude of the negative simultaneous impact of the crisis on remittance outflows (column 2). This differential impact of the crisis between UMC and HIC is confirmed by the positive sign of the interaction between real GDP and the crisis variable (column 3). The crisis appears to hit remittances harder in those countries with lower GDP. Similarly to the HIC analysis, the crisis seems to have a more negative effect on remittances in those countries with higher density of migrants (column 4). Unlike for the HIC sample, unemployment does not seem to play a significant role during the crisis for this extended sample (column 5).

4.2   Remittance inflows

In this section, we estimate equation (4) on a panel of both developed and developing countries. Given that one of our dependent variable, the (log) of the stock of emigrants, is available only for the years 1990 and 2000, we adopt a linear interpolation for the dependent variable on stocks of emigrants, so to have a 10 years time series.[9] Since the interpolation is likely to create an artificial time variation, as a robustness check we estimate the same equation using Instrumental Variable (IV) as well.[10] The main purpose of this analysis is to crosscheck whether the elasticities of remittance inflows to host countries GDP are in line with the estimates of elasticities of remittance outflows to developed countries GDP, as in equation (2). Since the two samples are composed of different countries, and we do not have the exact same set of control variables, we do not expect the two elasticities to coincide. We can, though, consider these results as the upper bound for a range of values that will represent the response of remittances from developed countries to a global crisis, useful for the analysis in Section 5.

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[9] As a robustness check, we also run estimates using a two years panel. We found the results not significantly affected: the dependent variable representing the stock of emigrants is always significant and its value is in a range between 1 and 3, depending on which measure of stock is taken into consideration (skilled vs. unskilled; female vs. male). The elasticity to host countries GDP is also always positive and significant, and its range is between 5 and 7.The lower bound is close to the upper bound of the elasticities estimated using a 10 years panel, so we are confident that this unsatisfactory wide range is possible as a result of the limited amount of observations we are left with (220) when we employ this approach.

[10] Since our sample of interest is the one composed of developing countries, we report the results only for IV estimates in this sub-sample.

Table 5: Determinants of remittance inflows, 1990-2000

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimator	FE	FE	FE	FE	FE	FE	IV
Sample	All	No-HIC	All	No-HIC	All	No-HIC	No-HIC
	Rem infl	Rem infl	Rem infl	Rem infl	Rem infl	Rem infl	Rem infl
Log stock of emigrants (total)	1.093***	1.117**	1.203***	1.090**	1.252***	1.355***	0.987
	(3.28)	(2.57)	(3.44)	(2.59)	(3.14)	(2.72)	(0.44)
Lagged real GDP (home)	-0.120	0.169	0.207	0.380	0.188	0.431	0.341
	(-0.27)	(0.33)	(0.48)	(0.80)	(0.43)	(0.88)	(0.53)
Real GDP (host)	2.748	3.080	4.047**	4.545**	3.385*	3.707*	4.249**
	(1.32)	(1.33)	(2.13)	(2.20)	(1.80)	(1.74)	(2.27)
Log population			-1.375	-1.366	-1.697	-1.615	-2.555**
			(-1.24)	(-1.04)	(-1.50)	(-1.23)	(-2.54)
Lagged inflation (home)			-0.037	-0.043	-0.035	-0.043	-0.046
			(-1.21)	(-1.20)	(-1.12)	(-1.18)	(-1.52)
Inflation (host)			-0.057	-0.070	-0.055	-0.068	-0.067*
			(-1.05)	(-1.19)	(-1.07)	(-1.18)	(-1.85)
Lagged exchange rate (home)			0.043	0.034	0.028	0.020	0.014
			(0.82)	(0.63)	(0.53)	(0.36)	(0.30)
Lagged exchange rate (host)			-0.237***	-0.322***	-0.229**	-0.303***	-0.321***
			(-2.61)	(-2.94)	(-2.47)	(-2.66)	(-3.59)
Share of emigrants with primary education					1.835	0.408	
					(0.71)	(0.12)	
Share of emigrants with secondary education					4.266	4.433	
					(1.43)	(1.12)	
Share of female emigrants					-1.622	-3.288	
					(-0.41)	(-0.73)	
Constant	-37.347*	-46.818*	-36.175	-42.504	-25.778	-34.435	
	(-1.70)	(-1.95)	(-1.52)	(-1.51)	(-1.09)	(-1.21)	
Observations	1353	994	1245	917	1245	917	880
Countries	151	114	148	112	148	112	105
R-sq. (within)	0.17	0.18	0.21	0.23	0.21	0.23	-
Weak identification test							4.196

Note: Robust t statistics in parentheses; all equations include both fixed and time effects. In Column (7), the excluded instrument is the age dependency ratio. *** p<0.01, ** p<0.05, * p<0.1.

We report in Table 5 the estimates for the 10 years panel. In every equation country, time-fixed effects are included but not reported. Each estimation is done for the entire sample, and for the sample excluding HIC. Columns 1 and 2 start with a basic specification, including as dependent variables lagged domestic real GDP, real per capita GDP of the host countries and overall stock of emigrants. We find a positive and significant elasticity on the emigrants' stock variable, whose elasticity is not statistically different from unity (and is quite close to the value obtained from the estimates on outflows). The host countries' output and lagged real GDP are not significant, although we note how the value for the elasticity of the GDP of host countries is twice the size of that estimated in the outflows equation.

In equations (3) and (4), we include as controls both home and host countries' macroeconomic variables.[11] The elasticity to host countries' GDP increases and becomes significant: its value reaches 4 for the whole sample and 4.5 for the non-HIC sample. This rise in the GDP coefficient is explained entirely by the change in the sample composition. When we replicate the same regression as in column 1 on the sample of column 3, the coefficient on GDP is very close to that in column 3.[12] We find that inflation in both home and host countries does not play a significant role: anyway, the signs suggest

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[11] For some control variables (nominal exchange rate and inflation) we use one lag to avoid endogeneity problem. The main results, including the elasticities, are very similar when using the contemporaneous values of the variables (results available on request).

[12] Results available from the authors on request.

that the higher the inflation in home countries, the lower the remittances in the following period, and the higher the inflation in host countries, the lower the amount of money remitted the following period. This reveals the negative indirect welfare effects of inflation on migrants' decision to remit. The lagged nominal exchange rate is also significant, but negatively related for its level in host countries and positively related, but not significant, for its level in home countries: the previous period depreciation in host countries is associated with a next period reduction in remittance flows, while a domestic depreciation is associated with higher inflows next period.

In columns (5) and (6) we decompose the stock of emigrants controlling for their education level and gender. When we include these further controls, the elasticity of inflows to the stock of emigrants comes much closer to the estimates for outflows in Table 3, while the elasticity of inflows to GDP in host countries decreases to a value between 3.3 and 3.7. Further, we find that the level of remittances is positively related to primary and secondary education of emigrants, but not significantly. When we include as controls the gender of emigrants, we find that women emigrants are negatively associated with the level of remittances, but the result is not significant.

Finally, in the last column, we perform IV estimates using the age dependency ration. We instrument the overall stock of emigrants and find the elasticity to migrant stock to have the same sign and lower magnitude, but to be insignificant. The explanatory power of the instruments is also quite unsatisfactory (weak test statistics in 4.5). Nonetheless, the signs and significance of the other coefficients are in line with previous estimates. In particular, elasticity to the GDP of host countries is 4.3.

We find a range of values for the elasticity of remittances to GDP in host countries, between 3 and 4.5. This variation is quite substantial, and is quite close that of previous work: for example, the International Monetary Fund (IMF, 2005) finds an elasticity of 5. As a robustness check, we performed the same estimation transforming the variables in real terms, and per capita terms, but we did not find any significant changes in the range of estimates. In the next section, we will experiment with these estimated coefficients and discuss possible changes in the value of remittances as a consequence of the global financial crisis.

However, this range of values for the remittance-GDP elasticity is well above that based on the outflows estimation. We offer four reasons to explain such a large difference. First, as mentioned in Section 3, the data on inflows and outflows are different. In particular, the former add up to a much larger total than the latter and this could partly explain the larger coefficients we find in the estimation of equation (4).

Second, the control variables that we use are not the same, owing to data availability. And, as noticed in the preceding discussion, the inclusion of further control variables restricts the sample and may change the coefficients substantially, including that of host GDP. In fact, when we include real interest rates (of both host and home countries), the sample reduces substantially and the GDP coefficient increases further.

Third, the time periods considered are different. The outflow results are based on the 1990-2007 period, whereas the inflow ones are based on the 1990-2000 period. This owes to a lack of migration stock data for home countries outside 1990-2000 (host countries' immigration stock data are available from the UN population statistics every five years up to 2005). When we restrict the sample to the 1990-2000 period for the outflows' regressions, the coefficient of host GDP rises to 2.5, becoming closer to the estimates based on inflows data.[13] We believe it is more appropriate to base our outflows estimates on the extended period, as this covers the more recent years as well.

Fourth, the sample countries considered are slightly different. In the remittance outflows' estimation, we use only HIC and UMC as remittance-sending countries, and all remittance-receiving countries are considered. We defend this choice, as the vast majority of remittances to developing countries originate in developed countries (and to some extent in UMC). Thus, we are interested in the coefficients of the restricted sample for estimation purposes. In the inflows, we consider all the sending and receiving countries.

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[13] Results available from the authors on request.

5. Predictions on remittances to developing countries

The most recent World Bank (2009) estimates on remittances inflows to developing countries point to an increase by 8.7% in 2008 over 2007 (corresponding to $305 billion). This strong growth may reveal the resilience of remittances. However, if we look at Mexico, a country more exposed to the crisis that hit the US in 2007, the figure for 2008 reveals a drop in remittances by 3.4%.[14] Unfortunately, the World Bank does not have yet estimates on remittance outflows for 2008. In Table 8 we will provide a summary of our results and compare them to the most recent ones prepared by the World Bank in February 2009.

We use the methodology described in Section 3 to estimate the likely change in inflows as a consequence of the crisis. We combine the estimates in the previous sections (on the elasticity of inflows to global output and of outflows to the crisis as well as to host country's GDP) with the latest forecasted growth rate of GDP for 2009 and 2010 provided in the World Economic Outlook (IMF, 2009b). These forecasts predict a -3.8% decline in GDP in developed countries and a 1.6% growth rate in developing and emerging countries. Table 6 presents the results of the estimation based on both the outflows and inflows methods.

Table 6: Estimated remittance inflows to developing countries in 2009, by region

Developing countries	2008 (US$b)	2009e-I (US$b)	% change	2009e-II (US$b)	% ch.	2009e-III (US$b)	% ch.
(outflows-based estimates)	305.2	279.8	-8	271.7	-11	238.2	-22
(Inflows-based estimates)	2008e (US$b)	2009e-A (US$b)	Interval (US$b)	% ch.	2009e-B (US$b)	Interval (US$b)	% ch.
All developing countries	305	282	(278; 296)	-8	270	(278; 296)	-12
EAP	70	64	(59; 69)	-9	61	(57; 65)	-13
ECA	53	50	(47; 49)	-6	48	(47; 49)	-9
LAC	63	57	(53; 61)	-9	54	(50; 58)	-14
MNA	34	32	(30; 32)	-6	31	(30; 32)	-9
SAS	66	63	(63; 64)	-5	61	(61; 62)	-7
SSA	20	19	(19; 20)	-6	18	(19;20)	-9

Note: The share of remittances received from developed and developing countries is based on World Bank (2009). Outflows-based estimates: I and II are based on estimated coefficients from Table 4 (I assumes 71% and II assumes 90% of remittances to developing countries from HIC); III is based on estimated coefficients from Table 5. See Sections 3.1 and 5 for a description of the methodology and assumptions. Inflows-based estimates: A assumes a 3% elasticity to growth rate. B assumes 4.5%. Interval is the 95% confidence interval of the forecast. See Sections 3.2 and 5 for a description of the methodology and assumptions. *Source*: Authors' elaboration on IMF and World Bank estimates. Growth in Developed countries is assumed at -2% and 3% in developing countries.

We start by estimating the predicted level of remittances in 2009 using equation (3). We apply two methods, which would give lower and upper bounds of estimates. First, we use the results in Table 4 for HIC with $\hat{b}_3$ =1.5 and $\hat{b}_4$ =-0.07.[15] On the basis of the estimates' bands of the south–south component of remittances to developing countries suggested by Ratha and Shaw (2007), we assume that HIC account for 80% of the total remittances sent to developing countries (i.e. average between 71% and 90%, which are the bound estimates in Ratha and Shaw). The rest of remittances come from developing and emerging economies, for which $\hat{b}_4$ =0 as they are not considered to be hit by systemic financial crisis, and $\hat{b}_3$ =1.5 as well. These assumptions yield an estimate band for remittances to developing countries in 2009 of $272 billion (lower bound), or a 11% drop over 2008, and $279 billion (upper bound), or a 8% drop.[16]

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[14] The Central Bank of Mexico's estimate shows a similar figures, -3.6%.
[15] We assume that the coefficient b_4 is the same as estimated from previous crises. The extent to which this may apply to the current crisis as well may be disputable but it is the most carefully derived estimate of the one-off cost of the crisis available.
[16] The lower bound of the estimate assumes that HIC account for 90% of remittances to developing countries, whereas the upper bound assumes a 71% share for HIC.

We can also apply a different method based on the estimated coefficients of the pooled sample of HIC and UMC from Table 5. In that $\hat{b}_4$=-0.2, $\hat{b}_3$=1.5 and ΔGDP=-1.3% (i.e. world output growth for 2009 as estimated by the IMF). This method yields a bigger drop in remittances to developing countries at $238 billion in 2009, or a 22% drop over 2008. According to the outflows-based methods, the estimated drop in remittances to developing countries ranges between $25 and $67 billion.

We then use estimates of the inflows-GDP elasticities from Table 5 and use equation (5) to predict the inflows in 2009 and 2010. According to this method, we expect a drop in remittances between -3% under the baseline scenario and about -4.5% under scenario B, which assumes a higher responsiveness of inflows to growth rate in developed countries. The remittance estimates based on inflows data are slightly above those based on outflows data, as the latter are subject to the estimated one-off cost of the crisis (between 7% and 19%). On the other hand, the regression based on inflows cannot properly capture the one-off effects of the crisis and thus its estimated drop constitutes a lower bound of the possible drop. The estimates based on inflows are not far from but slightly more negative than those of the World Bank (2009), which forecasts a drop of remittances inflows between -5% and -8% for 2009. Even when considering the largest estimated drop, remittances still show a high degree of resilience to the crisis relative to other resource flows, such as private finance (see Calì et al., 2008).

We can also predict the flows to individual developing regions on the basis of this method. The regions that seem more likely to be affected by the crisis are LAC and the EAP, given their relatively higher share of remittances received from HIC (above 80%), in particular from the US and the OECD region. SAS, SSA and MNA are likely to observe more moderate drops, around -6/8%, given that in 2008 their share of remittances from US and Western Europe and other HIC was below 70%. Overall, our estimates based on the inflows elasticity with respect to GDP elasticity show that the crisis may induce a drop in remittances to developing countries between $23 and $35 billion. This is a smaller range than those obtained through the outflows methods, although the drops are comparable with the lower bound estimates obtained with the outflows method. The larger estimates' range given by the latter method owes to the idea that the crisis may lead to a one-off reduction in remittances that is independent from the change in income. Such an effect determines larger swings in remittances than estimates based on the remittances-GDP elasticity.

On the basis of GDP growth estimates for 2010 and the inflows method, we can also compute the likely levels of remittances to developing countries and to the individual regions for 2010. Table 7 points to a clear increasing trend for the inflows in all the regions. This is the consequence of the IMF forecasts of a return to a quasi-normal pattern of growth for the world economy.

Table 7: Estimated remittance inflows, 2010

	2009f-A (US$b)	2010f-A (US$b)	Interval (US$b)	% ch.	2009f-B (US$b)	2010f-B (US$b)	Interval (US$b)	% ch.
All developing countries	282	312	(293; 338)	5	270	315	(294; 337)	8
EAP	64	70	(66; 75)	4	61	70	(66; 74)	7
ECA	50	56	(52; 61)	7	48	57	(52; 62)	10
LAC	57	63	(60; 67)	4	54	63	(59; 66)	6
MNA	32	35	(33; 39)	7	31	36	(33; 39)	10
SAS	63	71	(65; 79)	8	61	73.61	(67; 81)	12
SSA	19	21	(19; 23)	7	18	21	(19;23)	10

Note: The share of remittances received from developed and developing countries is based on World Bank (2009). A assumes a 3% elasticity to growth rate. B assumes 4.5%. Interval is the 95% confidence interval of the forecast. See section 3.2 and 5 for a description of the methodology and assumptions. *Source*: Authors' elaboration based on IMF and World Bank estimates. Growth in developed countries is assumed at 1% and 5% in developing countries.

These estimates provide some idea of the scale of the direct losses for one of the largest sources of external capital for developing countries but, as with all estimates, some caution is needed in interpretation. First, they are based on a number of assumptions that may or may not hold true; second, the depth and length of the current crisis is still unclear. Third, these estimates are for all developing countries and the macro regions; wide variations across countries can be expected.

Table 8: Comparison of World Bank forecast and our main forecasts

		World Bank forecasts, March 2009				Our main forecasts, March 2009			
		Base case		Low case		Base case		Low case	
	2008e*	2009f	2010f	2009f	2010f	2009f	2010f	2009f	2010f
US$b									
Developing countries	305e	290	299	280	280	272[A];282[B]	312	239[A];270[B]	315
EAP	70	67	68	64	64	64	70	61	70
ECA	53	48	50	46	47	50	56	48	57
LAC	63	60	62	58	58	57	63	54	63
MNA	34	33	34	32	32	32	35	31	36
SAS	66	63	65	61	62	63	71	61	73.61
SSA	20	19	20	18	18	19	21	18	21
Growth rate (%)									
Developing countries	8.8	-5	2.9	-8.2	0.2	-8[A]; 8[B]	5	-12[A]; -22[B]	8
EAP	6.6	-4.2	1.9	-7.5	-1.3	-9	4	-13	7
ECA	5.4	-10	4.2	-13	1.6	-6	7	-9	10
LAC	0.2	-4.4	2.3	-7.7	-1.0	-9	4	-14	6
MNA	7.6	-1.4	2.9	-5.2	-0.9	-6	7	-9	10
SAS	26.7	-4.2	3.4	-7.3	0.5	-5	8	-7	12
SSA	6.3	-4.4	3.5	-7.9	0.0	-6	7	-9	10

Notes: *World Bank forecast is based on the March 2009 data on remittances. [+] Our estimates are based on February 2009 data on remittances. A estimates based on outflows' predictions. B estimates based on inflows' predictions. See Table 6 and Section 3.1 and 5 for explanations.

6. Conclusions

The impact on remittances is likely to be an important transmission mechanism of the effects of the global financial crisis on developing countries. This paper has provided a range of estimates for the likely impact of the GFC on remittances. These estimates are based on estimated coefficients derived from carefully specified models of the determinants of remittance outflows and inflows. The former model has allowed us to test for the direct effects of past systemic banking crises on remittance outflows. The results suggest that the crisis is likely to have some independent remittance-reducing effect not captured by the impact of the crisis on GDP. On the basis of this independent effect of the crisis (and on the estimated elasticity of outflows with respect to host country GDP), we estimate that remittances to developing countries could drop by between $ 25 and $67 billion in 2009. Using our estimated remittance inflows-host countries' GDP elasticity, we find a more modest – but still significant – range of remittances' drop: between $23 and $35 billion in 2009. The regions that seem more likely to be affected by the crisis are LAC and the EAP, given their relatively higher share of remittances received from HIC. SAS, SSA and MNA are likely to experience more moderate drops. Forecasts on GDP growth in 2010 suggest that remittances to developing countries may start to grow again in 2010, although at a slower rate than before the crisis.

Once the impact of the crisis on remittance inflows to developing countries has been identified, the important question concerns the implication of this change in inflows on development and growth.

This is a complex question to address, and it goes beyond the scope of this paper, but we can sketch the multiple channels through which remittances may display their effects on development. At the micro level, remittances have positive direct (and possibly indirect) effects on the households that receive them. These would be part of the household income and may directly contribute to poverty reduction.[17] Recent evidence from Ghana (Adams et al., 2008) suggests that the use of remittances at the margin is not different from any other sources of income. Thus, a decrease in remittance receipts may have similar effects on the households (and eventually on the economy) as any other reductions in income.

The effects of remittances on poverty are more relevant the higher the share of poor households receiving them. To the extent that remittances play an important role in smoothing household consumption over time (see Quartey and Blankson, 2004 on Ghana), an eventual drop in remittance inflows may have direct adverse effects on consumption (e.g. food, social services) and thus on poverty. Remittances can have indirect effects as well, in that they may help accumulate factors of production (human as well as physical capital) that could increase future income for the receiving household. For instance, Edwards and Ureta (2003) find that in El Salvador increase in remittances was associated to more than proportional increases in education levels.[18]

Any such effects of changes in remittance inflows would need to be captured through household surveys by examining the way in which households adjust their consumption and investment patterns owing to changes in remittances. If the size of remittances in the economy is large (see Table 1), and/or if the drop in remittances is substantial, some effects may be felt beyond the household at the macro level as well.[19] It would be difficult to isolate such impacts at the country level without developing new

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[17] Estimates from the World Bank (2006) show that in recent years total remittances have led to reduced poverty levels in low income countries, e.g. by about 11% in Lesotho, 5% in Ghana and 6% in Bangladesh. Adams and Page (2003) provide more structural evidence of poverty-reducing effects of remittances. They estimate that a 10% increase in remittances reduces poverty by 3.5% across a large number of developing countries.

[18] This could probably be explained considering that the demand elasticity for education with respect to income is higher than one.

[19] Straubhaar and Vadean (2005) argue that remittances may be more beneficial than official development assistance and foreign direct investment; as their use is not tied to specific investment projects with high implementation content, they do not entail interest payments and they are likely not to be repaid.

household surveys, although some changes in growth rates and poverty levels may be evident for highly remittance-dependent countries.

Some effects of the crisis on development and growth may work through the migration channel as well, although these would be more complicated to identify. To the extent that there is some larger effect of the crisis in developed than in developing countries – as current forecasts seem to imply (e.g. IMF, 2009b) – the crisis may induce a larger than usual share of migrants from developing countries to return to their home country. This is a potentially positive channel, in that return migrants may bring back increased know-how, access to capital and networks, which may benefit the source country. If large enough, return migration may also be felt on the labour markets through changes in the labour supply and in the equilibrium wage. Lack of migration data constrains any impact assessments of the possible effect of the crisis via these migration-related channels. One way to get a sense of this impact may be at the sectoral level. For instance, if there are sectors which experience high return migration in certain countries, it may be possible to evaluate the effects of this return on wages and skills availability in those sectors. Also, it may be possible to identify national labour market effects (e.g. on wage levels) in countries with high levels of return migration, or with large decreases in out-migration rates.

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Annex: Variables description

Variables	Description	Source
Emigrants stock	Total number of emigrants toward OECD countries, by gender and education	Docquier at al. (2008)
Real GDP	Real GDP, base year 2000, US$	WDI
Stock immigr.	Number of immigrants in the host country	WDI
		UN/DESA
Share fem immigr.	Number of female immigrants in host country	WDI
		UN/DESA
Inflation	Inflation rate in outflows sending country (host) or inflows receiving country (home), based on consumer price index	WDI
Nominal X-rate	The nominal exchange rate in the outflows sending country (host) or inflows receiving country (home), period average	IFS
Pop	Total population in host country	WDI
Errors and omissions	US$ billion amount of errors and omissions in the BOP, as a share of GDP	WDI
Real GDP (home)- Outflows equation	Weighted average of real GDP in migrants sending countries i, weighted by the share of immigrants in country j: $\sum_{i} \mathrm{Re}\,alGDP_{j,t} * share\_immigrants_{ij,2000}$, t=1970, 2007	WDI
		Parsons et al. (2007)
Nominal X-rate (home)- Outflows equation	Weighted average of nominal exchange rate in migrants sending countries i, weighted by the share of immigrants in country j: $\sum_{i} Nom\_X\_Rate_{j,t} * share\_immigrants_{ij,2000}$, t=1970, 2007	IFS
		Parsons et al. (2007)
Inflation rate (home) Outflows equation	Weighted average of inflation in migrants sending countries i, weighted by the share of immigrants in country j: $\sum_{i} Inflation_{j,t} * share\_immigrants_{ij,2000}$, t=1970, 2007	WDI
		Parsons et al. (2007)
Real GDP (host)- Inflows equation	Weighted average of real GDP in migrants receiving countries j, weighted by the share of emigrants from country i: $\sum_{j} \mathrm{Re}\,alGDP_{j,t} * share\_emigrants_{ij,2000}$, t=1970, 2007	WDI
		Parsons et al. (2007)
Inflation (host)- Inflows equation	Weighted average of inflation in migrants receiving countries j, weighted by the share of emigrants from country i: $\sum_{j} Inflation_{j,t} * share\_emigrants_{ij,2000}$, t=1970, 2007	WDI
		Parsons et al. (2007)
Nominal X-rate (host)- Inflows equation	Weighted average of nominal exchange rate in migrants receiving countries j, weighted by the share of emigrants from country i: $\sum_{j} Nom\_X\_Rate_{j,t} * share\_emigrants_{ij,2000}$, t=1970, 2007	IFS
		Parsons et al. (2007)

Note: IFS = International Financial Statistics.