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WHAT TYPES OF CAPITAL FLOWS HELP IMPROVE INTERNATIONAL RISK SHARING?

Ergys Islamaj
M. Ayhan Kose

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Rumelifeneri Yolu 34450 Sarıyer/Istanbul

What Types of Capital Flows Help Improve International Risk Sharing?

Ergys Islamaj and M. Ayhan Kose*

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Abstract. Cross-border capital flows are expected to lead to increased international risk sharing by facilitating borrowing and lending in global financial markets. This paper examines risk-sharing outcomes of various types of capital flows (foreign direct investment, portfolio equity, debt, remittance, and aid flows) in a large sample of emerging market and developing economies. The results suggest that remittances and aid flows are associated with increased international risk sharing. Other types of capital flows are not consistently correlated with better risk-sharing outcomes. These findings are robust to the use of different econometric specifications, country-specific characteristics, and other controls.

Keywords: capital flows; remittances; aid flows, international risk sharing.
JEL classification: E1, F02, F4, G01

* Islamaj (*Contact author;* World Bank; eislamaj@worldbank.org). Kose (World Bank, Brookings Institution, CAMA, and CEPR; akose@worldbank.org). We thank Pablo Acosta, Joshua Aizenman, Yin-Wong Cheung, Menzie Chinn, Poonam Gupta, Helen Popper, Andrea Presbitero, Sergio Schmukler, Nikola Spatafora, Mark Spiegel, Naotaka Sugawara, Frank Westermann, an anonymous referee, and participants of the conference on "Financial Globalization and De-globalization: Perspective and Prospects" for useful comments. The views expressed in this paper are those of the author(s) and do not necessarily represent those of the World Bank Group, its Board of Executive Directors, or the governments they represent.

1. Introduction

The ability to disentangle fluctuations in consumption from those in output is an important determinant of economic welfare. Ownership of foreign assets and access to short-term foreign borrowing during downturns are simple arrangements that help de-link movements in domestic consumption from those in output (Obstfeld 1994; Lewis 1996). Provided that fluctuations in output are not fully synchronized across countries, and financial markets are operating efficiently, risks associated with output uncertainty can be shared across borders through capital flows. This in turn helps lower the dependence of consumption movements on domestic output fluctuations and improves international risk sharing.

An extensive empirical literature finds only minimal impact of cross-border capital flows, such as FDI, portfolio equity, and debt flows, on international risk sharing.[1] Some types of capital flows are correlated with improved risk sharing in advanced economies, but there appears to be no robust relationship between most types of capital flows and the extent of risk sharing in emerging market and developing economies (EMDEs). Although different types of capital flows have been extensively investigated in this context, there has been no comprehensive study on the implications of remittances and foreign aid flows for international risk sharing. Remittances and aid flows are seen as substitutes to cross-border capital flows as they account for a significant source of external finance in EMDEs (Figure 1).

We study the role of remittances and foreign aid flows as possible drivers of the temporal changes in the sensitivity of country-specific consumption to country-specific output changes. This sensitivity is a standard measure of international risk sharing in the empirical literature. Our study also presents a comprehensive comparison of the impact of various types of capital flows on international risk sharing outcomes. We find that remittances and aid flows are correlated with better international risk sharing outcomes in EMDEs. Other types of capital flows, such as FDI, equity and debt flows, do not appear to have a consistently significant impact on risk sharing. These findings are robust to the use of different econometric specifications, country-specific characteristics, and other controls.

The ability of remittances to de-link fluctuations in country-specific consumption growth from those in country-specific output growth is closely related to the motives to remit. These motives may affect the volume of flows and their variability during the business cycle. The most basic distinction is between altruistic motives and those driven by self-interest. If remittances are driven by altruistic motives, they tend to be counter-cyclical and contribute to a lower sensitivity of consumption to income changes. On the other hand, if they are driven by self-interest and are mainly used for investment purposes, they are often pro-cyclical and lead to higher comovement between consumption and output growth (Acosta, Lartey and Mandelman 2009). Evidence suggests that remittances are acyclical with respect to the

[1] See Kose, Prasad and Terrones (2009), Bai and Zhang (2012), Rangvid, Santa-Clara and Schmeling (2016), and Hevia and Servén (2018) for implications of different types of cross-border flows for international risk sharing using various econometric and modeling approaches, country samples, and time periods.

recipient country's business cycle.[2] Remittances, unlike other types of capital flows, are unrequited transfers that do not have to be paid back and target the very consumers who are more likely to be liquidity constrained. They are intra-household, private flows, likely driven by altruism and hard to expropriate selectively. As such, they have the potential to disentangle fluctuations of consumption from those of output, thus improving standard measures of international risk sharing.

Foreign aid flows also have the potential to improve risk sharing outcomes. Unlike other types of private flows, aid flows are voluntary transfers between countries. They are not expected to be paid back if they take the form of gifts and grants (or they can be low-interest loans). They often target the poorest segments of society who do not have insurance arrangements to smooth income fluctuations. Since aid flows can help dampen the impact of adverse shocks on consumption, they can lower consumption volatility and improve risk sharing (Canova and Ravn 1996; Pallage, Robe and Beroube 2006).[3]

Both remittances and aid flows appear to be relatively more stable forms of foreign financing (Figure 2). The volatile and procyclical nature of private capital flows has been documented extensively (Reinhart and Reinhart 2009). However, remittances and aid flows do not display these types of sharp movements and they do not comove with other types of capital flows.[4] Indeed, during periods of financial crises, remittances tend to be resilient, often continuing their upward trend when other types of capital flows decline significantly (De et al. 2019).[5] Aid flows tend to increase when recipient countries experience adverse shocks (Dabla-Norris, Minoiu, and Zanna 2015). Remittances can help stabilize consumption inter-temporally by supporting saving and improving access to financial services (Adams and Cuecuecha 2013; Acosta, Lartey and Mandelman 2009; Mandelman and Zlate 2012). Both remittances and aid flows have the potential to facilitate better consumption smoothing outcomes through their positive impact on financial sector development (Aggarwal, Demirguc-Kunt, and Martinez Peria 2011; Maruta 2019). These

[2] See De et al. (2019) for a detailed review of the motives to remit. They find that remittances and aid flows are typically acyclical. This implies that they have the potential to de-link consumption growth from business cycle fluctuations. While they present a survey of the behavior of remittances and aid flows over the business cycle, they do not undertake econometric exercises to quantitatively analyze the risk sharing implications of remittances and aid flows In contrast to De et al. (2019), this paper formally tests the risk sharing ability of remittances and aid inflows using a battery of econometric exercises.

[3] An extensive literature focuses on the impact of aid flows on economic growth (see Arndt, Jones and Tarp (2010) for a review). Some studies consider the relationship between aid flows and business cycle fluctuations (Pallage and Robe 2001; Faini 2006; Dabla-Norris, Minoiu, and Zanna 2015; Chauvet et al. 2019). Balli, Pierucci and Fu (2019) document that for a sample of 22 developing countries aid flows help *de-link* national income from domestic output fluctuations whereas Gardberg (2019) finds no robust correlation between aid inflows and risk sharing for a sample of 78 EMDEs during 1970-2014.

[4] The correlation of remittances with other types of capital flows, including FDI, has been found to be weak. For example, De et al. 2019 document that remittances are not strongly correlated with capital flows, with the median correlation equal to 0.08. Remittances are weakly correlated with portfolio equity flows, total inflows, official development assistance (ODA), and net exports.

[5] De et al. (2019) report that whereas other types of capital flows on average decline about 15 percent during the initial year of a sudden stop episode and continue to fall, on average, by another 10 percent the following year, remittances tend to increase by 6.6 percent during the first year and another 5.7 percent in the subsequent year. Aid flows also increase during sudden stop episodes. The results are similar during episodes of financial crises, including debt, banking and exchange rate crises.

features of remittances and aid flows imply that they can support activity in the face of economic adversity and help facilitate better risk sharing outcomes.[6]

Our paper relates to some other strands of the literature that focus on the behavior of different types of capital flows. For example, it is related to the seminal work by Lucas (1990) on the capital allocation puzzle that considers why so little capital flows from rich to poor countries. Many studies provide explanations for the puzzle: institutional underdevelopment and expropriation risk leading to capital flowing uphill (Alfaro, Kalemli-Ozcan and Volosovych 2008; Bai and Zhang 2010; Benhima 2013); investors overreacting to signs of trouble in EMDEs (Chinn, Dooley and Shrestha 1999; Chinn and Kletzer 2001).[7] Recent research considers the links between remittances and aid flows and illicit capital outflows. While flows such as development aid are found to be positively correlated with illicit outflows in the presence of capital controls, remittances are negatively correlated with illicit outward capital flight (Steinkamp and Westermann, 2021). Aid may be susceptible to being diverted by the recipient governments, but a similar behavior is unlikely to be tolerated by foreign workers supporting their families back home through remittances.

The remainder of the paper is structured as follows. The next section briefly describes the database and empirical framework. Section 3 analyzes the linkages between different types of capital flows and international risk sharing, and undertakes a battery of robustness tests. Section 4 offers a few concluding remarks.

2. Database and Empirical framework

2.1. Database

We examine the relationship between cross-border capital flows and international risk sharing using a database that includes a large sample of EMDEs. Real consumption and real GDP data are drawn from the World Bank's World Development Indicators (WDI). Population statistics are from the United Nations' National Accounts Main Aggregates Database. It is widely known that aggregate output and consumption data are nonstationary, whereas first differences of these variables are stationary. Hence, we follow the standard practice and carry out the analysis using first differenced series.

Total remittances include personal transfers, defined as all current transfers in cash or in kind received by resident households from nonresident households, and compensation of employees, defined as gross earnings of workers residing abroad. Remittance inflows are drawn from the IMF's Balance of Payments Statistics based on the Balance of Payments Manual 6 (BPM6). Foreign aid data are from the WDI and

[6] A few previous studies have investigated the ability of remittances to reduce macroeconomic volatility. Balli and Rana (2015) follow a methodology pioneered by Asdrubali, Sørensen and Yosha (1996) and show that remittances help *de-link* national income from domestic output fluctuations. Our paper studies how remittance inflows affect measures of international risk sharing. Differences in institutional quality and stages of development between countries that receive remittances and aid flows and those that send these flows can boost the risk sharing potential of remittances (Callen, Imbs and Mauro 2015; Parsley and Popper 2021).
[7] Other studies document that faster growing developing countries tend to receive more private capital inflows, but experience even more public capital outflows (Aguiar and Amador 2011; Alfaro, Kalemli-Ozcan and Volosovych 2014; Kim and Zhang 2020).

refers to net official development assistance and official aid (ODA). Net ODA definition excludes humanitarian aid, development food aid and debt relief grants. Financial flows data (*de facto* measures of financial integration) are drawn from the IMF's Balance of Payments accounts and Lane and Milesi-Ferretti (2007) data sets.[8] The database also includes *de-jure* measures of financial integration and trade openness. For de-jure financial integration, we use Chinn and Ito's (2006) measure, which offers the most comprehensive coverage of countries and period. Trade openness is defined as exports plus imports to GDP and series are drawn from the WDI. Following earlier work, we drop countries with population less than one million. We also drop countries for which fewer than 10 observations of remittance inflows are available. In the end, for our baseline results we utilize a sample of 79 EMDEs over the 1990-2018 period.[9]

2.2. Empirical Methodology

We follow standard literature that has tested various implications of the consumption Euler equation to estimate the extent of international risk sharing in aggregate data (Obstfeld, 1994; Lewis, 1996; Kose, Prasad and Terrones, 2009). These studies employ a simple framework that is based on the predictions of the standard complete markets model and regress country-specific consumption growth on country-specific output growth:

$$\Delta c_{t+1}^{j} - \Delta c_{t+1} = \alpha + \beta(\Delta y_{t+1}^{j} - \Delta y_{t+1}) + \epsilon_{t+1}^{j} \qquad (1)$$

where Δc_{t+1}^{j} (Δy_{t+1}^{j}) denotes country j consumption (output) per capita growth at time $t+1$; Δc_{t+1} (Δy_{t+1}) denotes world consumption (output) growth at time $t+1$; ϵ_{t+1}^{j} follows a stationary process and represents measurement error; and where β measures the extent of risk sharing. Theoretically, in a model with complete international financial markets and perfect risk sharing, the coefficient β, which captures the degree of countries' uninsured idiosyncratic consumption risk, is equal to zero. In practice, earlier studies interpret β pragmatically and argue that this coefficient can be used to measure the degree of risk sharing. The smaller the extent of idiosyncratic comovement between country-specific consumption and output growth the smaller β, and the greater the degree of international risk sharing (Asdrubali, Sørensen and Yosha 1996).[10] Δc_{t+1} and Δy_{t+1} are measures of aggregate (common) fluctuations on consumption and output, respectively. Since countries cannot eliminate risks associated

[8] The data set by Lane and Milesi-Ferretti (2007) on financial assets and liabilities ends in 2011. This data set is constructed using information from the IMF Balance of Payments as well as other sources. As a result, it offers a better coverage for developing economies in the earlier years of our sample compared to the IMF Balance of Payments. We use growth rates of each variable in Lane and Milesi-Ferretti's (2007) data set to extend the IMF Balance of Payments data backwards.

[9] The Appendix presents the list of countries. For comparison and further robustness, we also pool this country group with advanced economies. In that case, the sample includes 110 countries. On average, total remittances have been less than 0.2 percent of GDP in advanced economies, so we do not include them in the baseline. In the case of aid flows, WDI reports data for less than one-third of the advanced economies and only for the 1990-2004 period, so they are not included in the baseline. Aid flows to advanced economies averaged about 0.6 percent of GDP during the 1990-2004 period.

[10] The extent of risk sharing can be calculated as $(1-\beta)$ (Artis and Hoffmann 2012; Sørensen et al. 2007). If $\beta = 1$, then there is no risk sharing. If $\beta = 0$, then the country has achieved full risk sharing. The growth rates of aggregate consumption and output, Δc_{t+1} and Δy_{t+1}, are measured by the growth rates of the sum of country-specific consumption and output, respectively, of the countries in our sample.

with aggregate fluctuations, the common component of each variable is subtracted from the corresponding country specific variable.

To estimate more directly the quantitative effects of financial integration and capital inflows on international risk sharing, we follow the standard approach in the literature and consider the impact of each type of flows on the comovement between country-specific consumption growth and country-specific output growth (Lewis 1996; Kose, Prasad and Terrones 2009). In particular, we regress country specific consumption growth on country specific output growth:

$$\Delta c_{t+1}^{j} - \Delta c_{t+1} = \alpha + \gamma I_{jt+1} + \beta\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right) + \delta I_{jt+1}\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right) + \epsilon_{t+1}^{j} \quad (2)$$

where, I_{jt+1} represents cross-border financial flows (as a percent of GDP) at time t. The coefficient β estimates the sensitivity of country-specific consumption growth to country-specific-output growth, as in equation (1). An interaction term is added to the regression and measures the extent to which cross-border flows help *de-link* country-specific consumption growth from country-specific output growth. A negative δ suggests that the variable of interest (I_{jt+1}) can help lower the sensitivity of country-specific consumption growth to country-specific output fluctuations, and thus improve international risk sharing.

3. Remittances and International Risk Sharing

3.1. Baseline Results

We estimate equation (2) for an array of specifications and controls employing a dynamic panel framework that uses generalized least square (GLS) estimates for panel data following Ostergaard, Sørensen and Yosha (2002). This methodology allows estimation in the presence of $AR(1)$ autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels. Table 1 shows the effect of remittances and aid inflows on risk sharing for different country groups. We include all countries and EMDEs in our regressions. The results show that the interaction coefficients for remittances to GDP and aid inflows to GDP are negative and statistically significantly different from zero for all specifications. We also control for *de-jure* measures of financial integration, and the coefficients of interactions of remittances to GDP and aid inflows to GDP remain negative and statistically significant, suggesting that remittance and aid inflows are correlated with better international risk sharing.

The estimated coefficient from the regression of country-specific consumption growth on country-specific output growth is 0.8 in the baseline regression.[11] The effects of remittances and aid inflows on risk sharing are captured by the coefficient, δ, which is negative and statistically significantly different from zero. Following the framework in equation (2), the extent of risk sharing for an EMDE receiving remittance or aid inflows (relative to GDP) equal to the mean of the sample for the last 15 years (5.2 percent and 4.2 percent, respectively) can be calculated as $\left(1 - \beta - \delta * mean_{REM/AID}\right)$, where the last term ($\delta *$

[11] This estimate is close to those reported in previous studies (Kose, Prasad and Terrones, 2009; Fratzscher and Imbs, 2009).

$mean_{REM/AID}$) represents the portion of risk sharing achieved through remittances or aid ($mean_{REM/AID}$ refers to the mean of remittances or aid to GDP). The estimate of δ would suggest that, on average, about 19 percent of the achieved risk sharing in EMDEs can be attributed to remittances, and about 10 percent to foreign aid.

Next, we analyze how the presence of other types of capital flows affect our findings with respect to remittance and aid flows. In Table 2A we examine the relationship between risk sharing and remittance inflows to GDP, while controlling for other types of financial flows. The results show that the coefficient of the interaction of remittances to GDP with country-specific output growth is always negative and statistically significantly. This indicates that a higher volume of remittances relative to GDP is associated with a lower correlation between country-specific consumption growth and country-specific output growth, or better international risk sharing. The estimated coefficient δ appears to be stable (at around negative 0.01) across different specifications. Aid flows also help improve risk sharing outcomes (column 1). In contrast, the coefficients on the other variables, corresponding to the interaction of output growth with other types of cross-border flows, are not significant implying that there is no robust relationship between other types of capital flows and risk sharing (columns 2-8).

Table 2B shows the relationship between risk sharing and aid inflows to GDP, while controlling for other types of financial flows. As in the case of remittances, the results show that the coefficient of the interaction of aid flows to GDP with country-specific output growth is always negative and statistically significantly different from zero for the sample of EMDE economies. This indicates that foreign aid is associated with better international risk sharing. The estimated coefficient δ appears to be stable (at around negative 0.005) across different specifications. Other types of capital flows do not have a significant impact on risk sharing.

Table 3 compares the risk sharing potential of remittance and aid flows with that of other types of financial flows. The coefficient of interest, δ^i, is presented in the third row and corresponds to the interaction of country-specific per capita output growth with each of the variables. The second and third columns show the baseline results for the effects of remittance and aid inflows on risk sharing in EMDEs. The other columns study the effect of other types of cross-border flows. The results suggest that other capital flows are not robustly correlated with better risk sharing outcomes.

A higher stock of liabilities does not appear to be correlated with better risk sharing outcomes. The coefficient δ^i is not statistically different from zero for total liabilities, and for FDI and portfolio equity liabilities (columns 4-7). The composition of the stock of liabilities to GDP does not explain the lack of risk sharing associated with these types of flows. In the case of FDI, portfolio equity and debt flows, the coefficients have a negative sign, but they are not statistically significant (columns 8-10). *De-jure* financial openness and trade integration are not correlated with improved risk sharing (columns 11-12).

3.2. Robustness

To check the robustness of our findings, we conduct a battery of additional exercises. We control for different types of financial flows, and check the robustness of our results for different time periods, alternative specifications, and different country samples.

Additional controls. In Table 4A, we investigate the effects of remittance inflows on risk sharing while controlling for both de-jure financial integration and other types of financial flows. The main findings hold. First, remittances are robustly correlated with better international risk sharing outcomes. Second, the results also do not support the hypothesis that other types of cross-border financial flows, *de-jure* financial integration, or trade flows are correlated with better risk sharing outcomes.[12] These results are consistent with the results in the literature that fail to find a robust impact of financial flows on risk sharing in EMDEs (Kose, Prasad and Terrones 2009; Bai and Zhang 2012). Table 4B investigates the association between aid flows and risk sharing while controlling for both *de-jure* financial integration and other types of financial flows. The finding that foreign aid is correlated with increased risk sharing holds across different specifications.[13] Next, we check the robustness of our results while controlling for both remittances and aid flows, as well as de-jure financial integration and other types of financial flows. Table 5 shows that our main results hold across all specifications: remittances and aid flows are correlated with improved risk sharing.

Alternative methodologies, time periods and samples. The estimation of equation (2) may lead to various econometric challenges, especially in short samples. For example, if output is non-stationary and output growth exhibits positive serial correlation – as supported by aggregate data – the error term would predict future output and is correlated with contemporaneous output growth. This implies that consumption growth may be correlated with the error term. Therefore, Ordinary Least Squares (OLS) estimation would yield biased results as it would not control for endogeneity. In other words, β and δ would be unidentified if there exist no valid instruments for income growth. To overcome some of these challenges, we utilized a dynamic panel framework that uses generalized least square (GLS) estimates that control for autocorrelation within and across panels, as well as heteroskedasticity.[14] At the same time, these types of challenges are less likely to be a problem with long enough time series. Our sample is long enough to

[12] The literature does not provide clear guidance on the effects of trade on the sensitivity of consumption growth to income growth. Ostergaard, Sørensen and Yosha (2002) attribute a lower sensitivity of consumption to income changes in individual U.S. states (compared to the U.S.) to imports of an individual state being able to adjust relatively more rapidly. This is consistent with the theory that trade openness will help lower the sensitivity of consumption to income changes. On the other hand, trade integration may lead to specialization and an increase in output volatility (Kose, Prasad and Terrones, 2003).

[13] These results are consistent with insights from dynamic general equilibrium models suggesting that aid flows have the potential to alleviate the welfare costs of business cycle fluctuations in developing economies (Pallage, Robe and Berube 2006). Recent empirical work suggests that aid flows increase when aid receiving countries experience adverse shocks (Dabla-Norris, Minoiu and Zanna 2015).

[14] We also experimented with a dynamic panel framework using Arellano–Bond System GMM estimation, including as controls various lags of country-specific consumption growth and income growth. The results are broadly similar with the findings reported here. Because Arellano-Bond estimators can suffer from overidentification in long panels due to the large number of instruments generated, we present GLS estimates in our baseline (Roodman 2009).

produce results not subject to sample-size related caveats in a fixed panel regression framework (panel OLS).

We also check the robustness of our results for a longer time frame that spans the periods 1980-2018, 2000-2018, and for sub-samples of EMDEs that receive larger volumes of remittances and aid flows. The results are similar to the baseline findings, suggesting that remittances and aid flows are robustly correlated with better risk sharing outcomes.

4. Conclusions

We conduct an empirical analysis of the relationship between cross-border capital flows and international risk sharing outcomes in EMDEs. In particular, we study the relationship using a database that covers a large number of EMDEs over more than three decades. Theory predicts that cross-border financial flows should enhance opportunities to share risks efficiently, and thus lower the comovement between country-specific consumption growth and country-specific output growth.

Our empirical approach is straightforward as we simply study the role played by different types of capital flows in driving the temporal changes in the sensitivity of country-specific consumption to changes in country-specific output. Contrary to the predictions from standard theoretical models, cross-border flows (*de facto* measures of financial integration) and *de-jure* measures of financial integration do not appear to be correlated with better international risk sharing outcomes in EMDEs. Our results suggest that remittances and aid flows tend to be robustly correlated with better risk sharing outcomes.

Remittances and aid flows have certain features that make them naturally better candidates to improve cross-border risk sharing arrangements. Our findings point to at least two areas for future research. First, it would be useful to examine the risk-sharing consequences of different types of capital flows, including remittances and aid flows, using a dynamic multi-country general equilibrium model.[15] Second, future research can also focus on potential channels through which remittances and aid flows improve risk sharing outcomes by analyzing the interactions between these flows and country-specific characteristics and other cyclical and structural factors.

[15] Recent theoretical work suggests that limited international risk sharing in EMDEs can be the consequence of costs to adjusting portfolio positions that reduce short-term mobility of financial capital (Bengui, Mendoza and Quadrini 2013).

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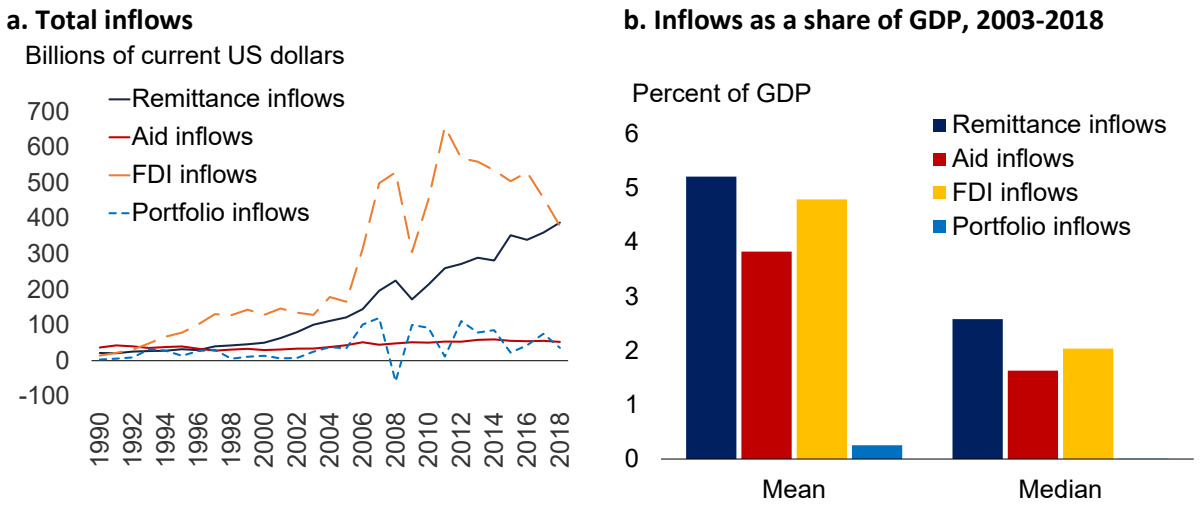
Appendix. List of countries

Advanced economies (31): Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, China, Ireland, Israel, Italy, Japan, Korea, Rep., Latvia, Lithuania, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States.

Emerging market and developing economies (79): Albania, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Eswatini, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Honduras, Hungary, India, Indonesia, Jamaica, Jordan, Kazakhstan, Kyrgyz Republic, Liberia, Malawi, Malaysia, Mali, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Namibia, Nicaragua, Niger, Nigeria, North Macedonia, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Russian Federation, Rwanda, Saudi Arabia, Senegal, Sierra Leone, South Africa, Sri Lanka, Sudan, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Uruguay, and Venezuela, RB.

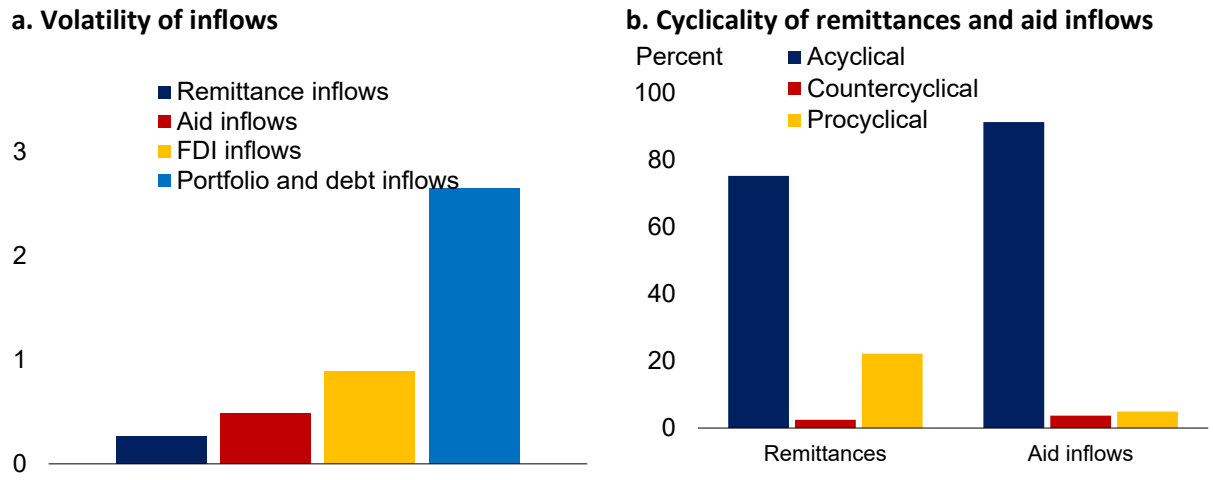
Figure 1. Remittances, aid and capital inflows to EMDEs



Sources: World Bank's World Development Indicators and IMF Balance of Payments.

Notes: a. Sum of 79 emerging market and developing economies. b. Mean refers to unweighted averages for the 2003-2018 period.

Figure 2. Cyclical properties of capital flows to EMDEs



Sources*:* World Bank's World Development Indicators and IMF Balance of Payments.

Notes: a. Bars represent median volatility across EMDE countries for each type of capital flow. Volatility is defined as the standard deviation of the detrended ratio of the relevant flow to GDP. b. Percent of countries with acyclical, countercyclical and procyclical remittance or aid flows. Cyclicality is defined as the correlation between the detrended real GDP and remittance or aid flows. Each series is decomposed into trend and cyclical components using a Hodrick-Prescott (HP) filter and the sample period is 1990–2018. Remittances are considered *procyclical* if the correlation between the cyclical components of remittances and output is positive and statistically different from zero, *countercyclical* if it is negative and statistically different from zero, and *acyclical* if the correlation is not statistically different from zero.

Table 1. Remittances, foreign aid inflows and international risk sharing

	EMDE	All countries	EMDE	All countries	EMDE	All countries	EMDE	All countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Output growth	0.799	0.758	0.810	0.808	0.829	0.829	0.849	0.858
	0.021***	0.016***	0.018***	0.017***	0.031***	0.029***	0.030***	0.029***
Remittance inflows	-0.174	0.011			-0.174	-0.035		
	0.116	0.103			0.120	0.107		
Remittances × Output growth	**-0.009**	**-0.006**			-0.009	-0.007		
	0.004**	0.004*			0.004**	0.004**		
Aid inflows			-0.421	-0.414			-0.414	-0.405
			0.135***	0.134***			0.135***	0.134***
Aid inflows × Output growth			**-0.005**	**-0.005**			**-0.005**	**-0.005**
			0.001***	0.001***			0.001***	0.001***
De- jure					-0.001	-0.004	-0.001	-0.001
					0.002	0.001***	0.002	0.002
De- jure × Output growth					-0.076	-0.124	-0.090	-0.105
					0.058	0.039***	0.056	0.050**
Constant	0.004	0.003	0.005	0.005	0.004	0.005	0.006	0.006
	0.003	0.002	0.003*	0.003*	0.003	0.002***	0.003**	0.003*
Observations	1,799	2,606	1,725	1,810	1,799	2,606	1,725	1,810
Number of ifscode	79	110	79	88	79	110	79	88

Sources: World Development Indicators, IMF Balance of Payments

Notes: Robust standard errors are reported in brackets. Generalized least squares regression model including time fixed effects. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth of per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. All countries include advanced economies. Sample period 1990-2018 or as dictated by availability of data. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for remittance inflows and aid inflows variables are multiplied by 10^3.

Table 2A. Remittances, cross-border flows and international risk sharing

	Aid inflows	Total liabilities	FDI liabilities	Portfolio equity liabilities	Debt liabilities	FDI inflows	Portfolio equity inflows	Debt inflows	Trade openness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output growth	0.836	0.800	0.801	0.791	0.804	0.803	0.800	0.802	0.810
	0.021***	0.025***	0.024***	0.024***	0.025***	0.021***	0.021***	0.022***	0.040***
Remittance inflows	-0.162	-0.184	-0.172	-0.202	-0.185	-0.172	-0.172	-0.173	-0.210
	0.116	0.117	0.116	0.120*	0.116	0.116	0.116	0.116	0.120*
Remittances × Output growth	**-0.009**	**-0.009**	**-0.010**	**-0.009**	**-0.009**	**-0.010**	**-0.009**	**-0.010**	**-0.009**
	0.004**	0.004**	0.004***	0.004**	0.004**	0.004***	0.004**	0.004**	0.004**
Interaction	-0.357	-0.003	-0.007	-0.056	-0.006	0.004	0.038	-0.003	0.025
	0.137***	0.003	0.012	0.048	0.005	0.026	0.100	0.012	0.019
Interaction × Output growth	**-0.005**	0.000	0.000	0.002	0.000	0.000	-0.002	0.000	0.000
	0.001***	0.000	0.000	0.002	0.000	0.001	0.003	0.000	0.001
Constant	0.005	0.004	0.003	0.004	0.004	0.003	0.004	0.004	0.002
	0.003*	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Observations	1,725	1,799	1,799	1,799	1,799	1,799	1,799	1,799	1,799
Number of countries	79	79	79	79	79	79	79	79	79

Sources: World Development Indicators, IMF Balance of Payments, Lane and Milesi-Ferretti (2007)

Notes: Emerging market and developing economies (EMDE) country group. Generalized least square regression model including time fixed effects. Robust standard errors are reported in brackets. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth of per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. Interaction refers to the variable in the respective column as percent to GDP. Sample period 1990-2018 or as dictated by availability of data. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for remittance inflows and interaction variables are multiplied by 10^3.

Table 2B. Foreign aid, cross-border flows and international risk sharing

	Remittance inflows	Total liabilities	FDI liabilities	Portfolio equity liabilities	Debt liabilities	FDI inflows	Portfolio equity inflows	Debt inflows	Trade openness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output growth	0.836	0.804	0.811	0.809	0.806	0.810	0.812	0.811	0.833
	0.021***	0.024***	0.021***	0.020***	0.022***	0.018***	0.018***	0.018***	0.038***
Aid inflows	-0.357	-0.389	-0.410	-0.436	-0.377	-0.421	-0.421	-0.423	-0.423
	0.137***	0.137***	0.135***	0.136***	0.139***	0.135***	0.135***	0.136***	0.136***
Aid inflows × Output growth	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.006**	**-0.005**
	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
Interaction	-0.162	-0.005	-0.005	-0.034	-0.009	-0.006	0.052	-0.029	0.027
	0.116	0.005	0.013	0.042	0.006	0.021	0.107	0.016*	0.018
Interaction × Output growth	**-0.009**	0.000	0.000	0.000	0.000	0.000	-0.003	0.001	0.000
	0.004**	0.000	0.001	0.002	0.000	0.001	0.003	0.000	0.001
Constant	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.006	0.004
	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003
Observations	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725
Number of countries	79	79	79	79	79	79	79	79	79

Sources: World Development Indicators, IMF Balance of Payments, Lane and Milesi-Ferretti (2007)

Notes: Emerging market and developing economies (EMDE) country group. Generalized least square regression model including time fixed effects. Robust standard errors are reported in brackets. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth of per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. Interaction refers to the variable in the respective column as percent to GDP. Sample period 1990-2018 or as dictated by availability of data. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for aid inflows and interaction variables are multiplied by 10^3.

Table 3. Determinants of international risk sharing

	Baseline	Remittance inflows	Aid inflows	Total liabilities	FDI liabilities	Portfolio equity liabilities	Debt liabilities	FDI inflows	Portfolio equity inflows	Debt inflows	De-jure	Trade openness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Output growth	0.771	0.799	0.810	0.770	0.772	0.762	0.774	0.774	0.772	0.773	0.807	0.783
	0.017***	0.021***	0.018***	0.021***	0.020***	0.019***	0.021***	0.017***	0.017***	0.017***	0.030***	0.039***
Interaction		-0.174	-0.421	-0.003	-0.005	-0.045	-0.007	0.002	0.030	-0.004	-1.371	0.017
		0.116	0.135***	0.003	0.012	0.048	0.005	0.026	0.098	0.012	1.731	0.018
Interaction × Output growth		**-0.009**	**-0.005**	0.000	0.000	0.003	0.000	0.000	-0.002	0.000	-0.083	0.000
		0.004**	0.001***	0.000	0.001	0.002	0.000	0.001	0.003	0.000	0.056	0.001
Constant	0.003	0.004	0.005	0.004	0.003	0.004	0.004	0.003	0.003	0.003	0.004	0.002
	0.003	0.003	0.003*	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Observations	1,799	1,799	1,725	1,799	1,799	1,799	1,799	1,799	1,799	1,799	1,799	1,799
Number of countries	79	79	79	79	79	79	79	79	79	79	79	79

Sources: World Development Indicators, IMF Balance of Payments, Chinn-Ito (2006), Lane and Milesi-Ferretti (2007)

Notes: Emerging market and developing economies (EMDE) country group. Generalized least square regression model including time fixed effects. Robust standard errors are reported in brackets. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth in per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. De-jure is the financial integration measure obtained from Chinn-Ito (2006). Sample period 1990-2018 or as dictated by availability of data. All regressions include a constant term. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for the interaction variables are multiplied by 10^3.

Table 4A. Remittances, cross-border flows, de-jure financial openness, and international risk sharing

	Aid inflows	Total liabilities	FDI liabilities	Portfolio equity liabilities	Debt liabilities	FDI inflows	Portfolio equity inflows	Debt inflows	Trade openness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output growth	0.869	0.825	0.824	0.815	0.827	0.826	0.829	0.828	0.828
	0.031***	0.032***	0.032***	0.033***	0.032***	0.031***	0.031***	0.031***	0.044***
Remittance inflows	-0.166	-0.185	-0.168	-0.198	-0.187	-0.165	-0.172	-0.169	-0.207
	0.120	0.121	0.120	0.123	0.120	0.120	0.120	0.120	0.124*
Remittances × Output growth	**-0.008**	**-0.009**	**-0.009**	**-0.009**	**-0.009**	**-0.010**	**-0.009**	**-0.009**	**-0.009**
	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**
Interaction	-0.353	-0.004	-0.007	-0.062	-0.007	0.003	0.035	-0.004	0.027
	0.137**	0.003	0.012	0.049	0.005	0.026	0.099	0.012	0.018
Interaction × Output growth	**-0.005**	0.000	0.000	0.003	0.000	0.000	-0.002	0.000	0.000
	0.001***	0.000	0.000	0.002	0.000	0.001	0.003	0.000	0.001
De- jure integration	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.002
	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
De- jure × Output growth	-0.082	-0.069	-0.063	-0.064	-0.066	-0.055	-0.073	-0.064	-0.078
	0.057	0.059	0.060	0.058	0.059	0.058	0.058	0.059	0.060
Constant	0.006	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003
	0.003*	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Observations	1,725	1,799	1,799	1,799	1,799	1,799	1,799	1,799	1,799
Number of countries	79	79	79	79	79	79	79	79	79

Sources: World Development Indicators, IMF Balance of Payments, Chinn-Ito (2006), Lane and Milesi-Ferretti (2007)

Notes: Emerging market and developing economies (EMDE) country group. Generalized least square regression model including time fixed effects. Robust standard errors are reported in brackets. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth of per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. De-jure is the financial integration measure obtained from Chinn-Ito (2006). Interaction refers to the variable in the respective column as percent to GDP. Sample period 1990-2018 or as dictated by availability of data. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for remittance inflows and interaction variables are multiplied by 10^3.

Table 4B. Foreign aid, cross-border flows, de-jure financial openness, and international risk sharing

	Remittance inflows	Total liabilities	FDI liabilities	Portfolio equity liabilities	Debt liabilities	FDI inflows	Portfolio equity inflows	Debt inflows	Trade openness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output growth	0.869	0.835	0.842	0.843	0.839	0.848	0.850	0.848	0.857
	0.031***	0.032***	0.031***	0.032***	0.032***	0.030***	0.030***	0.030***	0.043***
Aid inflows	-0.353	-0.378	-0.403	-0.430	-0.365	-0.414	-0.413	-0.417	-0.416
	0.137**	0.137***	0.135***	0.136***	0.139***	0.135***	0.135***	0.136***	0.135***
Aid × Output growth	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.006**	**-0.005**
	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
Interaction	-0.166	-0.006	-0.006	-0.037	-0.009	-0.007	0.052	-0.03	0.028
	0.120	0.005	0.013	0.043	0.006	0.021	0.106	0.0160*	0.018
Interaction × Output growth	**-0.008**	0.000	0.000	0.001	0.000	0.000	-0.003	0.001	0.000
	0.004**	0.000	0.001	0.002	0.000	0.001	0.003	0.000*	0.001
De- jure integration	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002
	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
De- jure × Output growth	-0.082	-0.083	-0.080	-0.084	-0.085	-0.088	-0.089	-0.090	-0.087
	0.057	0.057	0.057	0.056	0.057	0.056	0.056	0.057	0.057
Constant	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005
	0.004*	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**	0.003
Observations	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725
Number of countries	79	79	79	79	79	79	79	79	79

Sources: World Development Indicators, IMF Balance of Payments, Chinn-Ito (2006), Lane and Milesi-Ferretti (2007)

Notes: Emerging market and developing economies (EMDE) country group. Generalized least square regression model including time fixed effects. Robust standard errors are reported in brackets. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth of per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. De-jure is the financial integration measure obtained from Chinn-Ito (2006). Interaction refers to the variable in the respective column as percent to GDP. Sample period 1990-2018 or as dictated by availability of data. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for aid inflows and interaction variables are multiplied by 10^3.

Table 5. Remittances, foreign aid, cross-border flows and international risk sharing

	Total liabilities	FDI liabilities	Portfolio equity liabilities	Debt liabilities	FDI inflows	Portfolio equity inflows	Debt inflows	Trade openness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Output growth	0.856	0.863	0.864	0.860	0.868	0.870	0.868	0.877
	0.033***	0.032***	0.033***	0.033***	0.031***	0.031***	0.031***	0.043***
Remittance inflows	-0.172	-0.162	-0.193	-0.179	-0.166	-0.164	-0.172	-0.215
	0.121	0.120	0.122	0.121	0.120	0.120	0.121	0.124*
Remittances × Output growth	**-0.009**	**-0.009**	**-0.008**	**-0.009**	**-0.009**	**-0.009**	**-0.008**	**-0.008**
	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**
Aid inflows	-0.313	-0.343	-0.369	-0.300	-0.352	-0.352	-0.355	-0.357
	0.139**	0.137**	0.137***	0.142**	0.137**	0.137**	0.138**	0.137***
Aid inflows × Output growth	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.006**	**-0.005**
	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
Interaction	-0.006	-0.007	-0.046	-0.009	-0.006	0.058	-0.028	0.036
	0.005	0.013	0.043	0.006	0.021	0.107	0.016*	0.019*
Interaction × Output growth	0.000	0.000	0.000	0.000	0.000	-0.003	0.001	0.000
	0.000	0.001	0.002	0.000	0.001	0.003	0.000	0.001
De-jure integration	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
De-jure × Output growth	-0.073	-0.070	-0.077	-0.076	-0.078	-0.080	-0.081	-0.081
	0.059	0.058	0.057	0.058	0.058	0.057	0.058	0.058
Constant	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.004
	0.003*	0.003*	0.003**	0.003**	0.003*	0.003*	0.003**	0.003
Observations	1,725	1,725	1,725	1,725	1,725	1,725	1,725	1,725
Number of countries	79	79	79	79	79	79	79	79

Sources: World Development Indicators, IMF Balance of Payments, Chinn-Ito (2006), Lane and Milesi-Ferretti (2007)

Notes: Emerging market and developing economies (EMDE) country group. Generalized least square regression model including time fixed effects. Robust standard errors are reported in brackets. The dependent variable is the idiosyncratic growth of per capita consumption $\left(\Delta c_{t+1}^{j} - \Delta c_{t+1}\right)$. The estimates are based on equation (2). Output growth refers to idiosyncratic growth of per capita GDP $\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right)$. De-jure is the financial integration measure obtained from Chinn-Ito (2006). Interaction refers to the variable in the respective column as percent to GDP. Sample period 1990-2018 or as dictated by availability of data. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively. Coefficients and standard errors for remittance inflows, aid inflows and interaction variables are multiplied by 10^3.