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Remittances and Household Consumption Instability in Developing Countries

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Summary. — This paper analyzes the impact of remittances on household consumption instability in a large panel of developing countries. There are four main results. First, remittances significantly reduce household consumption instability. Second, remittances play an insurance role by dampening the effects of various sources of consumption instability in developing countries (natural disasters, agricultural shocks, discretionary fiscal policy, systemic financial and banking crises and exchange rate instability). Third, the stabilizing role played by remittances is stronger in less financially developed countries. Fourth, the overall stabilizing effect of remittances is mitigated when remittances exceed 6% of GDP.

Key words — remittances, consumption instability, financial development, shocks, threshold effects, developing countries

1. INTRODUCTION

The recent economic crisis has led policymakers and economists to rethink the instruments of economic stabilization. One of the most damaging consequences of output shocks is the consumption instability, which negatively affects risk adverse agents' welfare. [1] As Athanasoulis and Van Wincoop (2000) and Pallage and Robe (2003) point out, consumption instability can have detrimental consequences for the accumulation of human and physical capital.

Consumption instability is driven by a complex array of factors (Wolf, 2004): economic shocks, the determinants of the household income elasticity with respect to shocks and the determinants of the household consumption elasticity with respect to household income. Several characteristics of countries shape consumption instability. Economic size plays a crucial role: large economies with diversified production structures are more immune to both sector-specific shocks and—reflecting the negative association between size and openness—external shocks. Financial development opens new diversification opportunities and dampens consumption instability. The effect of shocks on macroeconomic instability depends on the extent to which participation in the international goods and asset markets allows for specialization and risk diversification. Fiscal policy can be used to offset shocks and smooth consumption, but large fiscal imbalances are also a factor of macroeconomic instability. Fiscal policy instability may in fact be linked to consumption instability through the connection between public and household budgets (Herrera & Vincent, 2008).

It is surprising that remittances are not addressed in the literature examining consumption instability, even though several papers have recently analyzed the potential stabilizing impact of migrants' remittances (Bugamelli & Paternò, 2009a, 2009b; Chami, Hakura, & Montiel, 2009; IMF, 2005; World Bank, 2006). The literature has focused on the low procyclicality and perhaps the counter-cyclicality of remittances with respect to GDP. Unlike other private capital flows, remittances tend to be hedges against shocks.

Two mechanisms through which remittances may affect household consumption instability can be put forward. First, remittances might act as an *ex-ante* risk management mechanism (risk avoidance). For instance, the remittance-receiving households in Burkina Faso and Ghana have houses built of concrete rather than mud and have greater access to communications, making them less prone to natural shocks. Moreover, Ethiopian remittance-receiving households rely more on cash reserves than the sale of productive assets during food crisis episodes (Mohapatra, Joseph, & Ratha, 2009). Remittances constitute a resilient factor at the household level that contributes to protecting the productive capacity through *ex-ante* investments, thereby smoothing income and promoting economic growth.

Second, remittances may reduce household consumption instability through their contribution to *ex-post* risk management (insurance). According to Mohapatra et al. (2009), remittances rise when the recipient economy suffers a natural disaster. Yang (2008) also provides cross-country evidence on the response of international flows to hurricanes and concludes that for poorer countries, increased hurricane exposure is associated with greater remittance flows as well as greater foreign aid. By contrast, other private flows (commercial lending, FDI, and portfolio investment) actually decline in response to hurricane exposure.

The stabilizing effect of remittances may be nonlinear. In other words, the marginal stabilizing impact may be stronger in some countries than in others for several reasons. On the one hand, remittances may smooth consumption more in less financially developed countries because the marginal benefit of remittances received by households increases with lower levels of financial development. [2] On the other hand, there is some evidence that the macroeconomic effects of remittances in the recipient economies may depend on the size of the

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remittance flows. Several explanations have been proposed. Chami et al. (2008), using a stochastic dynamic general equilibrium model with endogenous labor supply, showed that a high remittance-to-GDP ratio may actually enhance output instability due to the negative impact of these flows on the labor supply of remittance-dependent households. Chami, Hakura, et al. (2009) have used a cross-countries approach to highlight the diminished stabilizing effect of remittances on output when the flows exceed a 2% of GDP threshold. According to Abdih, Dagher, Chami, and Montiel (2008), a high remittance-to-GDP ratio may actually lead to more corruption. Other authors have shown that higher levels of remittances lead to the appreciation of the real exchange rate (Dutch Disease) in developing countries (Amuedo-Dorantes & Pozo, 2004; Bourdet & Falck, 2006; Lartey, Mandelman, & Acosta, 2008).

Therefore, this paper tries to answer several questions concerning the contribution of remittances to household consumption instability. (i) Do remittances significantly reduce the level of household consumption instability? (ii) What are the types of shocks that remittances insure against? (iv) Do the households' financial constraints reinforce the stabilizing effect of remittances? (v) Is there a threshold level of remittances beyond which their stabilizing impact diminishes?

A large cross-sectional panel of developing countries was constructed. To deal with the endogeneity of remittances, the System-GMM-IV was used in this paper. It allows instrumentation of remittances by their lagged value as well as two external instruments: the remittance ratio received by neighbor countries and the weighted GDP *per capita* of migrants' host countries. First, we found that remittances significantly reduce household consumption instability. Second, remittances appear to be a hedge against natural disasters, agricultural shocks, discretionary fiscal policy, financial and systemic banking crises, and exchange rate instability. Third, remittances work better in the less financially developed countries. Fourth, when remittances are too high, their stabilizing impact on consumption is weakened. These results are robust to alternative measures of remittances and financial development.

The rest of the article is organized as follows: Section 2 is devoted to the econometric investigation of the relationship between remittances and household consumption instability. In

Table 1. *Household consumption instability in developing countries*

Regions	5-Years subperiods						
	1975–79	1980–84	1985–89	1990–94	1995–99	2000–04	Average
East Asia and Pacific	2.87	4.70	5.52	3.33	4.80	1.96	3.80
Europe and Central Asia	–	–	3.85	9.23	7.82	4.81	6.28
Latin America and Caribbean	7.39	7.62	6.03	6.02	5.06	3.56	5.90
Middle East and North Africa	6.19	4.92	6.38	6.29	4.29	3.09	5.01
South Asia	6.35	3.66	2.47	3.10	5.80	2.83	4.01
Sub-Saharan Africa	8.32	7.96	10.11	9.49	7.03	6.38	8.16
Average	7.18	6.97	7.70	7.41	6.11	4.62	6.50

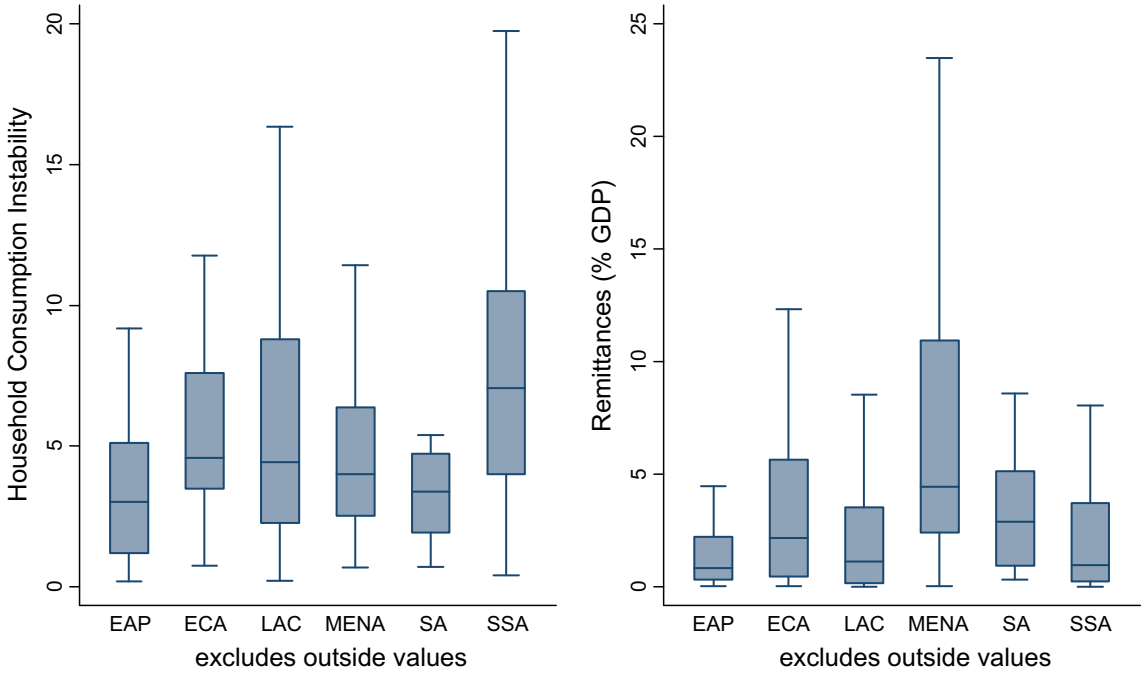

Figure 1. *Consumption instability and remittances in developing regions, 1975–2004. Note: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent values. EAP: East Asia and Pacific, ECA: Europe and Central Asia, LAC: Latin America and Caribbean, MENA: Middle East and North Africa, SA: South Asia, SSA: Sub-Saharan Africa. Source: World Bank, World Development Indicators (2009).*

Section 3, the hypothesis of the insurance role played by remittances when households are faced with various types of shocks is tested. The issue of nonlinear effects in the impact of remittances on consumption instability is addressed in Section 4. Robustness tests are presented in Section 5, and Section 6 concludes.

2. DO REMITTANCES REDUCE HOUSEHOLD CONSUMPTION INSTABILITY?

(a) *The econometric model*

The following dynamic panel model that captures the impact of remittances on consumption instability was estimated:

$$\sigma^{c}_{i,\tau} = \alpha + \rho\sigma^{c}_{i,\tau-1} + X'_{i,\tau}\beta + \phi_1 R_{i,\tau} + v_i + \eta_\tau + \varepsilon_{i,\tau}, \quad (1)$$

where $\sigma^{c}_{i,\tau}$ is the standard deviation of the real consumption *per capita* growth rate estimated over 5 years. For the purposes of the rest of the paper, we define this variable to be consumption instability. [3] Table 1 presents the evolution of consumption instability. Sub-Saharan Africa is most affected by the consumption instability. Moreover, a declining trend in consumption instability can be observed from 1980–85 to 2000–04.

Figure 1 shows the distribution of regional averages of consumption instability and the remittance ratio. It seems difficult to conclude that there is a negative correlation between remittances and consumption instability, given that the regions with low (high) remittances are not always those with high (low) consumption instability. However, Sub-Saharan Africa is characterized by both low levels of remittances and high consumption instability. These observations could be a symptom of the conditional effects of remittances on consumption instability that this econometric analysis attempted to reveal.

i and τ represent the country and the nonoverlapping 5-year period, respectively. v_i and η_τ represent the country and period fixed effects, respectively. The former was included to control for time invariant heterogeneity, and the later was included to control for common shocks at each period among countries in the sample. ε is the idiosyncratic error term. It is worth noting that estimation using panel data allows for the exploitation of the time series nature of the relationship between remittances and consumption instability. Since the magnitude of remittance inflows has changed substantially over time, this is an

Table 2. *Impact of remittances on consumption instability*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Remittances (% GDP)	−0.119***	−0.242***	−0.230***	−0.261***	−0.241***	−0.272***	−0.236***	−0.166***	−0.278**
	(2.73)	(3.72)	(3.29)	(4.42)	(3.64)	(2.84)	(2.78)	(4.33)	(2.28)
Private credit ratio (% GDP)			−0.052*		−0.057*	−0.045*	−0.037	−0.008	−0.030
			(1.69)		(1.85)	(1.73)	(1.14)	(0.35)	(0.87)
GDP *per capita* instability				0.407***	0.486**	0.537***	0.405**	0.327**	0.467**
				(2.87)	(2.55)	(2.83)	(2.44)	(2.16)	(2.64)
lag dependent variable	0.017	0.233*	0.235	0.263*	0.230	0.171	0.193	0.051	0.141
	(0.22)	(1.67)	(1.41)	(1.89)	(1.24)	(1.00)	(1.52)	(0.55)	(0.99)
Initial GDP *per capita*	1.128	−1.628***	−1.140**	−1.603***	−1.047*	−1.076*	−0.207	0.573	−0.467
	(0.80)	(3.10)	(2.01)	(3.29)	(1.97)	(1.82)	(0.26)	(0.26)	(0.43)
Trade openness	0.023	0.058**	0.062**	0.061***	0.063**	0.050*	0.040	0.026	0.036
	(1.42)	(2.50)	(2.42)	(2.75)	(2.55)	(1.84)	(1.37)	(1.32)	(1.03)
Government cons. (% GDP)	0.246*	0.653***	0.584**	0.632***	0.524**	0.470	0.538**	0.193	0.553
	(1.88)	(3.61)	(2.47)	(3.28)	(2.09)	(1.52)	(2.10)	(1.64)	(1.59)
Financial openness						4.683**		0.474	3.998*
						(2.09)		(0.34)	(1.88)
(Financial openness)^2						−0.859*		0.074	−0.776*
						(1.94)		(0.20)	(1.87)
Aid (% GDP)							0.160	0.171	0.140
							(1.51)	(1.61)	(0.98)
Constant	−5.247	3.644	2.007	1.993	0.529	−0.505	−4.638	−4.241	−4.843
	(0.56)	(1.02)	(0.51)	(0.60)	(0.15)	(0.10)	(1.00)	(0.29)	(0.84)
Observations	300	294	265	294	265	265	263	269	263
Countries	89	87	77	87	77	77	77	79	77
AR(1): *p*-value		0.004	0.008	0.004	0.026	0.049	0.013		0.078
AR(2): *p*-value		0.213	0.322	0.163	0.329	0.254	0.271		0.200
Hansen *p*-value		0.814	0.681	0.647	0.437	0.161	0.631		0.304
Instruments		18	19	19	20	25	22		26

Note: The estimation method is a two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping 5-year periods between 1975 and 2004. The dependent variable is consumption instability.

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

important advantage. The data were organized into a panel consisting of at most 87 countries over the period 1975–2004. The data were averaged over nonoverlapping 5-year periods so that—data permitting—there are six observations per country (1975–79, 1980–84, 1985–89, 1990–94, 1995–99, and 2000–04).

R is the remittances variable, measured as the ratio of remittances to GDP. We followed the World Bank by defining this variable as the sum of workers' remittances and compensation of employees. Moreover, we primarily used the sum of these two variables because for many developing countries the statistical distinction between the two can be highly problematic (Bugamelli & Paternò, 2009b). Nevertheless, following the narrow definition of remittances (Chami, Fullenkamp, & Gapen, 2009)—which excludes compensation of employees—an alternative measure was employed in Section 5. Whenever the ratio of remittances to GDP seemed more relevant to capturing the economic importance of these flows in a country, an alternative measure of remittances *per capita* was used in Section 5.

X is a matrix of control variables that includes the following: [4]

- *Per capita* income growth instability. This variable is measured by the standard deviation of the real GDP *per capita* growth rate over 5-year subperiods; we expected a positive marginal impact that catches the effect of aggregate shocks on consumption instability (Herrera & Vincent, 2008).

Table 3. *Remittances, various shocks and consumption instability: testing for the insurance role*

	Natural disasters (1)	Agricultural shock (2)	Fiscal shock (3)	Financial and banking crisis[a] (4)	Financial and banking crisis[b] (5)	Exchange rate shock (6)	Inflation shock (7)	Aggregate shock (8)
Remittances (% GDP)	−0.053	0.022	0.133	−0.069	−0.156	−0.178**	−0.136**	0.025
	(0.85)	(0.33)	(1.38)	(0.46)	(1.11)	(2.21)	(2.42)	(0.41)
Remittances × *Shock*	−0.015***	−0.011***	−0.026***	−0.010***	−0.629**	−0.023**	0.000	−0.028**
	(2.97)	(4.58)	(4.18)	(3.13)	(2.30)	(2.32)	(0.01)	(2.64)
Remittances × '*Other shocks*'	−0.027**	−0.023**	0.000	−0.002	−0.015	−0.024	−0.042***	
	(2.40)	(2.35)	(0.02)	(0.03)	(0.32)	(1.56)	(3.58)	
Shocks	0.154*	0.179***	0.188*	0.079***	3.218***	0.109*	0.000	0.605***
	(1.68)	(4.09)	(1.83)	(4.85)	(3.07)	(1.72)	(0.25)	(3.16)
'*Other shocks*'	0.432**	0.449***	0.373*	0.375*	0.442**	0.387**	0.580***	
	(2.45)	(2.65)	(1.70)	(1.85)	(2.18)	(2.13)	(2.91)	
Private credit ratio (% GDP)	−0.053**	−0.037	−0.042*	−0.046*	−0.046	−0.062	−0.049*	−0.042*
	(2.20)	(1.59)	(1.73)	(1.84)	(1.31)	(1.61)	(1.67)	(1.68)
lag dependent variable	0.279	0.108	0.223	0.260	0.203	0.177	0.325	0.225
	(1.46)	(0.67)	(1.26)	(1.30)	(1.00)	(1.07)	(1.38)	(1.40)
Initial GDP *per capita*	−0.216	−1.082*	−0.462	−0.724	−1.296	−1.070**	−0.865	−0.744
	(0.21)	(1.93)	(0.76)	(1.17)	(1.62)	(2.04)	(1.42)	(1.53)
Trade openness	0.051***	0.038*	0.045**	0.039	0.057	0.058**	0.044	0.046*
	(2.70)	(1.76)	(2.29)	(1.45)	(1.43)	(2.25)	(1.62)	(1.83)
Government consumption (% GDP)	0.273	0.380**	0.176	0.223	0.440	0.635*	0.250	0.380
	(1.38)	(2.22)	(0.76)	(0.81)	(1.17)	(1.80)	(1.19)	(1.41)
Financial openness	2.456	3.955**	1.537	3.180*	2.599	3.808	2.891*	3.436*
	(1.45)	(2.22)	(0.84)	(1.69)	(1.04)	(1.58)	(1.75)	(1.82)
(Financial openness)^2	−0.455	−0.775**	−0.309	−0.583*	−0.444	−0.680	−0.433	−0.651*
	(1.33)	(2.25)	(0.84)	(1.68)	(0.88)	(1.49)	(1.25)	(1.71)
Constant	−1.499	1.942	1.790	2.666	3.566	−1.571	3.525	−1.377
	(0.17)	(0.50)	(0.28)	(0.48)	(0.68)	(0.32)	(0.58)	(0.29)
Observations	265	256	264	265	265	258	255	265
Countries	77	77	77	77	77	70	74	77
Joint significance of '*Shocks*' coeff. (*p*-value)	0.000	0.000	0.000	0.006	0.066	0.044	0.055.	0.022
Remittance ratio required for a 'full stabilization'	10.059	16.216	7.129	7.729	5.114	4.780	..	21.389
Number of countries concerned	5	2	9	7	15	14	..	1
AR(1): *p*-value	0.028	0.089	0.032	0.031	0.036	0.024	0.049	0.025
AR(2): *p*-value	0.122	0.213	0.743	0.069	0.164	0.093	0.151	0.148
Hansen *p*-value	0.259	0.563	0.315	0.080	0.135	0.554	0.436	0.231
Instruments	29	30	31	30	30	33	33	28

Note: the estimation method is a two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping 5-year periods between 1975 and 2004. The dependent variable is consumption instability.

[a] The consolidated output losses (in% of country total output) due to the financial and systemic banking crisis (Laeven & Valencia, 2010).

[b] A dummy variable which takes the value 1 if a there is banking or financial crisis in each country over each of the 5-year subperiod (Laeven & Valencia, 2010).

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

- *Per capita* income. Consumption instability is expected to be lower in more developed countries (Auffret, 2003; Bekaert, Harvey, & Lundblad, 2006). We included the logarithmic term GDP *per capita* at the beginning of each period.
- Financial development. The degree of consumption smoothing could depend on the depth and the efficiency of financial markets (Ahmed & Suardi, 2009; Bekaert et al., 2006). It seems plausible that consumption smoothing is strongly determined by the availability of credit; hence, the ratio of bank-provided private sector credit to GDP was assumed to be a measure of financial development. However, as a robustness check in Section 5, we also defined financial development as the ratios of deposits to GDP and broad money (M2) to GDP.
- Trade and financial openness. The literature on trade openness and macroeconomic instability likewise combines theoretical ambiguity with varied empirical findings. Enhanced real integration can lead to greater sectional specialization but also provides greater diversification across demand sources (Di Giovanni & Levchenko, 2009). On the one hand, financial openness increases the degree of exposure to world financial crises. On the other hand, financial openness offers new portfolio diversification opportunities. Trade openness was measured as the ratio of exports and imports of goods and services to GDP. Financial openness was measured as the Chinn-Ito index (2008), rescaled to obtain only positive values. This index is introduced in a quadratic form to capture a threshold effect (Kose, Prasad, & Terrones, 2003).
- Government size. In developing countries, large government size (measured by the ratio of government consumption to GDP) could generate macroeconomic instability and economic inefficiencies. We therefore expected a positive correlation between this variable and consumption instability (Bekaert et al., 2006). [5]
- Foreign aid. Foreign aid may enhance the risk management mechanism. Moreover, countercyclical aid plays an insurance role. Aid is measured by the ratio of official development assistance to GDP.
- Lagged level of consumption instability. This variable catches the strong inertia which characterizes the dynamics of consumption instability.

If remittances increase as the vulnerability of the economy to shocks is increasing, the Ordinary Least Squares (OLS) estimator for ϕ_1 is biased upward. Moreover, the OLS estimator is inconsistent because the lagged dependent variable is correlated with the error term due to the presence of fixed effects. Hence, an econometric strategy based on instrumental variables must be implemented. The equation in levels and the equation in first differences are combined in a system and estimated with an extended System-GMM estimator that allows for the use of lagged differences and lagged levels of the explanatory variables as instruments (Blundell & Bond, 1998). [6] The GMM estimator controls for the endogeneity of the remittances and other explanatory variables. [7]

Two external instruments were added: the ratio of remittances to GDP for all other recipient countries located in the same region and the log-weighted GDP *per capita* for each of the migrant host countries (Acosta, Baerg, & Mandelman, 2009; Aggarwal, Demirgüc-Kunt, Peria, & Soledad, 2006). [8] External instruments weaken the potential "weak instruments" problem that often arises in the context of traditional GMM estimation.

Two specification tests were used to check the validity of the instruments. The first was the standard Sargan/Hansen test for overidentifying restrictions. The second test examined the hypothesis that there is no second-order serial correlation in the first-differenced residuals. The diagnostic tests do not invalidate the quality of the instrumentation within the System-GMM framework.

(b) *The preliminary results*

The results are presented in Table 2. The baseline model, estimated using both OLS with country fixed effects (column 1) and the System-GMM (column 2), included the lagged value of the dependent variable, trade openness, government consumption, initial level of development, and migrants' remittances. The two biases associated with the OLS estimator when applied to a dynamic model were confirmed. The coefficient of the lagged consumption instability is biased toward 0 and the coefficient of the remittance variable suffers from an upward bias. [9] As expected, remittances significantly reduced

Table 4. *Remittances, financial constraints and consumption instability*

	(1)	(2)	(3)
Remittances (% GDP)	−0.279***	−0.337***	−0.427***
	(3.80)	(5.04)	(4.49)
Remittances × Private	0.008**	0.012***	0.014**
credit ratio	(2.11)	(2.81)	(2.48)
Private credit ratio (% GDP)	−0.064**	−0.081**	−0.083**
	(2.14)	(2.52)	(2.20)
GDP *per capita* instability		0.498***	0.543***
		(2.67)	(2.96)
lag dependent variable	0.267*	0.255	0.165
	(1.71)	(1.52)	(1.01)
Initial GDP *per capita*	−0.969*	−0.842*	−0.907
	(1.75)	(1.69)	(1.50)
Trade openness	0.059**	0.062***	0.057*
	(2.63)	(2.79)	(1.92)
Government	0.471**	0.395**	0.451
consumption (% GDP)	(2.39)	(2.03)	(1.28)
Financial openness			4.344**
			(2.32)
(Financial openness)^2			−0.874**
			(2.30)
Constant	2.293	0.860	−0.999
	(0.58)	(0.24)	(0.21)
Observations	265	265	265
Countries	77	77	77
Joint significance of remittances' coef. (*p*-value)	0.001	0.000	0.000
Private credit *turning-point* (% GDP)	34.226	28.330	30.566
Countries above the threshold of private credit	11	22	17
Percentage of countries above the threshold	14	28	22
AR(1): *p*-value	0.006	0.014	0.053
AR(2): *p*-value	0.349	0.459	0.368
Hansen *p*-value	0.812	0.615	0.287
Instruments	21	22	26

Note: the estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping 5-year periods between 1975 and 2004. The dependent variable is consumption instability.

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

consumption instability. Trade openness, government consumption and lagged dependent variable amplify consumption instability. By contrast, *per capita* income negatively and significantly affects consumption instability. The signs of the control variables are consistent with early studies (Bekaert et al., 2006; Herrera & Vincent, 2008).

The next step consisted of adding a battery of control variables to check the robustness of these results to changes in the following model specifications (see columns 3–9): financial development, financial openness, foreign aid, and GDP *per capita* instability. Whatever controls are introduced, the coefficient for migrants' remittances remains strongly significant, negative, and relatively stable. Financial development contributes to consumption smoothing (column 3). It appears that GDP *per capita* instability is a significant source of consumption instability. As in Kose et al. (2003), financial openness is related to consumption instability in an inverted U relationship; the benefits of financial integration only appear beyond a given threshold (columns 6 and 9). Foreign aid does not significantly reduce consumption instability (columns 7–9).

3. WHAT SHOCKS ARE MITIGATED BY REMITTANCES?

The following equation was estimated to test the hypothesis that remittances insure differently against natural disaster, agricultural and discretionary fiscal policy shocks, financial and banking crisis, nominal exchange rate shocks, and inflation shocks (*Sh*):

$$\sigma^{c}_{i,\tau} = \alpha + \rho\sigma^{c}_{i,\tau-1} + \phi_1 R_{i,\tau} + \phi_2(R_{i,\tau} \times Sh_{i,\tau}) + \phi_3(R_{i,\tau} \times M_{i,\tau}) + \delta_1 Sh_{i,\tau} + \delta_2 M_{i,\tau} + X'_{i,\tau}\beta + v_i + \eta_\tau + \varepsilon_{i,\tau}. \quad (2)$$

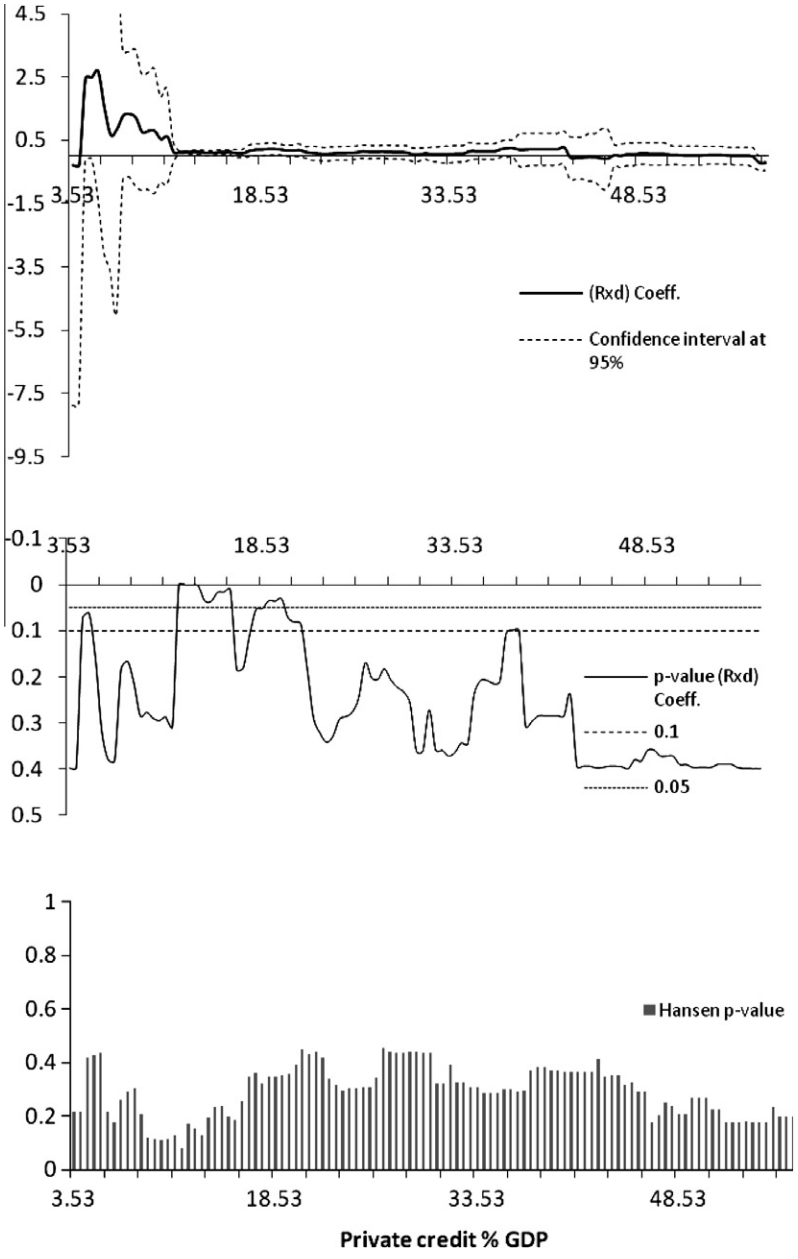

Figure 2. *Evolution of the coefficient associated with the interactive term of remittances crossed with the private credit ratio ($R \times d_{FD}$): Nonlinear System-GMM Estimation.*

In other words, the aggregate shock (GDP *per capita* instability) was broken-down into several sources of GDP instability.[10] The strategy consisted of identifying the stabilizing impact of remittances against specific shocks (Sh) while controlling for the impact of *other* shocks (M).[11] This strategy allowed ranking the stabilizing impact on various shocks. ϕ_1 captures the stabilizing impact of remittances (R) when Sh and M both equal 0. There is no specific claim for the sign of ϕ_1, given that in a world without shocks ($M = Sh = 0$) the insurance role of remittances could disappear. By contrast the insurance role of remittances implies a negative sign for ϕ_2 and ϕ_3. The destabilizing effect of shocks on consumption means that δ_1 and δ_2 are both positive. When δ_1 and ϕ_2 have opposite signs, a threshold level of remittances arises:

$$\frac{\partial \sigma^c_{i,\tau}}{\partial Sh_{i,\tau}} = \delta_1 + \phi_2 R_{i,\tau} = 0 \Rightarrow R^* = -\frac{\delta_1}{\phi_2},$$

where R^* measures the minimum remittance ratio required for a full absorption of the shocks.

The natural disaster data were drawn from Center for Research on the Epidemiology of Disasters (CRED), Emergency Events Database (EM-DAT).[12] CRED defines a disaster as a natural situation or event, which overwhelms local capacity, necessitating a request for external assistance (Noy, 2009; EM-DAT Glossary of terms).[13] We considered all disaster events taken together within a country in a year rather than each of them examined separately. Indeed, different regions in a country can be affected by different types of disasters in a given year; because remittances data are available only at annual frequency and at the country level, we would not be able to separate the response of remittances to a specific disaster (Mohapatra et al., 2009). The reported measure of the total number of people affected is used. The number of people affected is divided by the total population in the year prior to the disaster year (Mohapatra et al., 2009; Noy, 2009).

Agricultural, nominal exchange rate, and inflation shocks were measured by the standard deviations over 5 years of agricultural value added over GDP, nominal effective exchange rate and consumer price index growth rates, respectively. Fiscal shocks were measured by the standard deviation of the residual component of the log difference of government consumption from an econometric model of the former over the log difference of GDP, with a time trend and inflation in a quadratic form (Fatas & Mihov, 2003).[14] We took advantage of the recent database of Laeven and Valencia (2010) to model financial and banking crises. We used both a dummy variable for the occurrence of a crisis and a continuous variable for output losses due to the crisis (see Appendix data definition for more details).

The results are presented in Table 3.

In most cases, after controlling for the stabilizing impact of remittances on other shocks, the coefficients associated with the interaction terms (remittances crossed with each type of shock) are negative and highly significant. The additively introduced shocks variables are, as expected, positively and significantly related to consumption instability. Inflation is the sole exception (column 7). Moreover, whatever the specifications, the coefficients of specific shocks and of remittances interaction terms are *jointly* significant. Therefore, we were able to compute the threshold level of remittance ratios that fully absorb the shocks. The range of the thresholds runs from 5% of GDP for the exchange rate shocks to 16% for the agricultural shocks. It appears that the full absorption of natural disasters (column 1) and agricultural shocks (column 2) requires much higher levels of remittances: 10% and 16%, respectively. A partial explanation for this finding can be put forward. Natural disasters and agricultural shocks hit a large fraction of the population in developing countries and are more recurrent. Hence, the required level of remittances is higher. This fact is reinforced by the importance of the financial constraints that characterize a number of countries in the developing world.

In column 8, we test the stabilizing impact of remittances in the presence of aggregate instability (GDP *per capita* instability). The result indicates that the positive effect of GDP *per capita* instability on consumption instability decreases with the level of remittance inflows. Nevertheless, we notice that a huge ratio of remittances (21% of GDP) is required to fully stabilize consumption in the case of aggregate volatility.

4. HETEROGENEITIES IN THE LEVELS OF FINANCIAL DEVELOPMENT AND REMITTANCES: TESTING FOR NONLINEARITIES

This section is devoted to the identification of potential heterogeneities in the relationship between remittances and consumption instability. First, we focus on the stabilizing

Table 5. *Remittances, financial constraints and consumption instability: Nonlinear System-GMM method*

Remittances (% GDP)	−0.197**
	(2.07)
Remittances × $d_{FD} = 1[FD \geqslant 20.03\%]$	0.206**
	(2.28)
Private credit ratio (% GDP)	−0.044
	(1.58)
GDP *per capita* instability	0.563***
	(3.03)
lag dependent variable	0.230
	(1.42)
Initial GDP *per capita*	−0.936**
	(2.01)
Trade openness	0.046*
	(1.76)
Government consumption (% GDP)	0.466
	(1.41)
Financial openness	4.216*
	(1.98)
(Financial openness)^2	−0.784*
	(1.90)
Constant	−1.714
	(0.31)
Observations	265
Countries	77
Joint significance of remittances (p-value)	0.047
Threshold of private credit ratio	20.031
Countries above the threshold	35
Percentage of countries above the threshold	45
AR(1): p-value	0.036
AR(2): p-value	0.267
Hansen p-value	0.394
Instruments	30

Note: the estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. T-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping 5-year periods between 1975 and 2004. The dependent variable is consumption instability.

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

impact conditional on the financial constraints. Second, we analyze whether the level of remittances could modify the marginal impact of remittances on consumption instability.

(a) *Do remittances stabilize more in less financially developed countries?*

We first estimated the following model:

$$\sigma^c_{i,\tau} = \alpha + \rho\sigma^c_{i,\tau-1} + \phi_1 R_{i,\tau} + \phi_2 (R_{i,\tau} \times FD_{i,\tau}) + \delta FD_{i,\tau} + X'_{i,\tau}\beta + v_i + \eta_\tau + \varepsilon_{i,\tau}, \quad (3)$$

where *FD*, a proxy for the level of financial development, represents the ratio of bank credit to GDP [15]. X' is the matrix of control variables. The hypothesis is that $\phi_1 < 0$ and $\phi_2 > 0$; so, the impact of migrants' remittances $\phi_1 + \phi_2 FD_{i,\tau}$ is more stabilizing at low levels of financial development. Moreover, when ϕ_1 and ϕ_2 have opposite signs, a threshold effect arises: $\frac{\partial \sigma^c_{i,\tau}}{\partial R_{i,\tau}} = \phi_1 + \phi_2 FD_{i,\tau} = 0 \Rightarrow FD^* = -\frac{\phi_1}{\phi_2}$.

The results are presented in Table 4.

In column 1, few control variables are introduced. The nonlinear relationship hypothesis is not rejected. The marginal stabilizing impact of remittances decreases with the level of financial development. This result holds whatever the set of control variables (column 2 with GDP *per capita* instability and column 3 with GDP *per capita* instability and financial openness). Moreover, the test of the joint significance of ϕ_1 and ϕ_2 rejects the hypothesis that there is no nonlinearity. It also appears that the higher the level of private credit available, the lower the consumption instability. From column 3, the threshold level of private credit that ensures the marginal impact of remittances on consumption instability is negative stands at 30% of GDP. Also, 78% of the countries have levels consistent with an overall stabilizing impact of remittances on consumption.

While a reinforced stabilizing effect for remittances in less financially developed countries is intuitive, the opposite conclusion (remittances leading to an instability of consumption in high financially developed countries) is more striking. Three partial explanations can be proposed. First, remittances may be strongly procyclical in highly financially developed countries and so exacerbate business cycles and fuel consumption instability. However, recent papers seem to invalidate this conjecture (Giuliano & Ruiz-Arranz, 2009). Second, the insurance role of remittances may be reduced in highly financially developed countries because households can resort to the banking system to smooth their consumption. Moreover, in this context, remittances could then primarily finance the purchase of land and

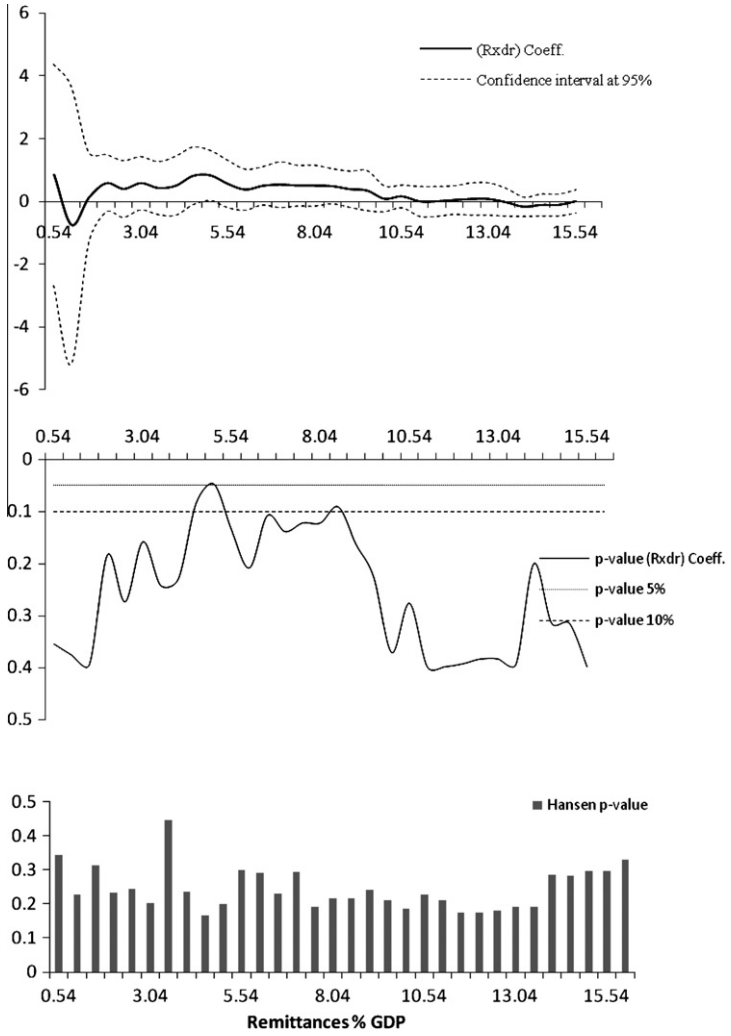

Figure 3. *Evolution of the coefficient associated with the nonlinear term in remittances ($R \times d_R$): Nonlinear System GMM Estimation.*

housing and therefore contribute to a boom in the real estate sector. Hence, remittances inflows may affect the consumption patterns of both the remittance-receiving and nonremittance-receiving households in the community. This mechanism is reinforced when banks recognize remittances as a form of collateral, which can increase the availability of loans. [16]

An alternative model for this nonlinearity that needed to be tested was implemented with rolling estimations for the different values taken by the ratio of private credit. A new variable, d_{FD}, in interaction with the remittances variable was specified; d_{FD} is equal to 1 if the country has a private credit ratio greater than FD^* and 0 otherwise. This methodology for threshold determination in the case of endogenous regressors in a System-GMM framework has previously been implemented by Masten, Coricelli, and Masten (2008) and Chami, Hakura, et al. (2009). [17] The following equation is specified:

$$\sigma^c_{i,\tau} = \alpha + \rho\sigma^c_{i,\tau-1} + \phi_1 R_{i,\tau} + \phi_2(R_{i,\tau} \times d_{FD}) + \delta FD_{i,\tau} + X'_{i,\tau}\beta + v_i + \eta_\tau + \varepsilon_{i,\tau}, \quad (4)$$

with $d_{FD} = \mathbf{1}[FD \geqslant FD^*]$.

Table 6. *Threshold effects in the relationship between remittances and consumption instability: Nonlinear System-GMM method*

Remittances (% GDP)	−1.067**
	(2.31)
Remittances × $d_R = \mathbf{1}[R \geqslant 5.5\%]$	0.824**
	(2.06)
Private credit ratio (% GDP)	−0.049**
	(2.43)
GDP *per capita* instability	0.485***
	(2.90)
lag dependent variable	0.134
	(0.94)
Initial GDP *per capita*	−0.938*
	(1.67)
Trade openness	0.054**
	(2.44)
Government consumption (% GDP)	0.336
	(1.27)
Financial openness	3.045
	(1.44)
(Financial openness)^2	−0.564
	(1.31)
Constant	2.871
	(0.62)
Observations	265
Countries	77
Joint significance of remittances (*p*-value)	0.027
Threshold of remittance ratio	5.5%
Countries above the threshold	13
Percentage of countries above the threshold	17
AR(1): *p*-value	0.052
AR(2): *p*-value	0.511
Hansen *p*-value	0.300
Instruments	26

Note: the estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping 5-year periods between 1975 and 2004. The dependent variable is consumption instability.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

The top 5% and bottom 5% of the observations of the private credit ratio were dropped to ensure feasible identification of the threshold. Private credit thresholds were explored in increments of 0.5%. Each equation corresponding to a different threshold was estimated by the System-GMM method. Under the System-GMM framework, the optimal threshold is the one that maximizes the overidentification Hansen test *p*-value. Testing nonlinear effects simply refers to the test of the null hypothesis that the coefficient for the interactive variable ϕ_2 is equal to zero. The results of the simulations are presented in Figure 2. The first graph shows the evolution of the coefficient ϕ_2 (the 95% confidence interval for the coefficient is shown by dotted lines) and the second graph shows the statistical significance of this coefficient. The third graph gives the Hansen test *p*-value for each model.

As expected, in most cases ϕ_2 is positive. The optimal cutoff, which maximizes the Hansen test *p*-value, is a private credit ratio of 20.03%.

Table 7. *Remittances and consumption instability: alternative measures of financial development*

	(1)	(2)
Remittances (% GDP)	−0.676**	−0.407**
	(2.04)	(2.50)
Remittances × bank deposit ratio	0.010*	
	(1.84)	
Bank deposit ratio (% GDP)	−0.068**	
	(2.19)	
Remittances × M2 ratio		0.005**
		(2.02)
M2 (% GDP)		−0.045**
		(2.09)
GDP *per capita* instability	0.573***	0.663***
	(3.56)	(3.53)
lag dependent variable	0.128	0.133
	(1.01)	(1.01)
Initial GDP *per capita*	−1.181***	−1.176***
	(2.69)	(3.81)
Trade openness	0.074**	0.067***
	(2.47)	(3.28)
Government consumption (% GDP)	0.242	0.234
	(1.04)	(1.41)
Financial openness	3.612*	3.266*
	(1.76)	(1.74)
(Financial openness)^2	−0.681	−0.621
	(1.64)	(1.66)
Constant	3.567	3.579
	(0.87)	(0.99)
Observations	265	294
Countries	77	87
Joint significance of remittances (*p*-value)	0.119	0.044
Turning point of financial development	65.13	81.68
Number of countries above the threshold	2	4
AR(1): *p*-value	0.066	0.055
AR(2): *p*-value	0.911	0.590
Hansen *p*-value	0.458	0.600
Instruments	27	27

Note: the estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping 5-year periods between 1975 and 2004. The dependent variable is consumption instability.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

The corresponding estimation is shown in Table 5. All the diagnostic tests associated with the System-GMM estimator validate the specification.

The role of migrants' remittances in enhancing the ability of households to smooth consumption is effective up to a private credit ratio of 20.03% (which is obtained in 55% of the countries). However, this value for the private credit ratio threshold is different from that estimated in model 5, in which we found a value of 30%. This difference arises because rolling estimations allow for the determination of an optimal threshold identified among a wide range of potential thresholds. So, this result is preferred to the previous one.

(b) *Does the stabilizing impact of remittances depend upon the level of remittances?*

We tested the hypothesis of a threshold for remittances beyond which the impact on consumption instability may be weakened.

We used the same methodology to allow for the endogenous determination of the threshold. The following equation was specified:

$$\sigma^{c}_{i\tau} = \alpha + \rho\sigma^{c}_{i,\tau-1} + X'_{i\tau}\beta + \phi_1 R_{i\tau} + \phi_2(R_{i\tau} \times d_r) + v_i + \eta_\tau + \varepsilon_{i\tau}, \quad (5)$$

with $d_r = \mathbf{1}[R \geqslant R^*]$.

The variable d_r is equal to 1 if the country has a value of remittances greater than R^* and 0 otherwise. The results are presented in Figure 3.

The optimal value of the remittance ratio is 5.5%. Table 6 presents the estimation of the model on the basis of the endogenously determined threshold.

When remittances exceed 5.5% of GDP (13 countries, 17% of the sample), the marginal stabilizing impact becomes weaker.[18] Compared to the 2% threshold computed by Chami, Hakura, et al. (2009) from an equation of output instability, the results suggest a high value of remittance ratio at which a much weaker stabilizing effect on consumption is observed. The permanent income hypothesis, which posits that consumption is less volatile than income, can provide an explanation. So, remittances need to be very high to lead to consumption instability, but a much lower level of remittances is sufficient to generate GDP instability.

5. ROBUSTNESS CHECKS

Two robustness checks were implemented. First, the stabilizing contribution of remittances conditional on the level of financial development was reexamined with alternative mea-

Table 8. *Remittances and consumption instability: alternative measures of remittances*

	Real remittances *per capita* (log)			Remittances *net* of compensations (% GDP)		
	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	−1.125**	−1.297**	2.781***	−0.713**	−0.540**	0.617**
	(2.35)	(2.10)	(2.72)	(2.49)	(2.07)	(2.46)
Remittances × Private credit ratio		0.035**			0.013**	
		(2.50)			(2.37)	
Remittances × GDP *per capita* instability			−0.426**			−0.105**
			(2.30)			(2.26)
Private credit ratio (% GDP)	−0.005	−0.082**	−0.039	−0.005	−0.063*	−0.072
	(0.17)	(2.30)	(0.72)	(0.21)	(1.86)	(0.92)
GDP *per capita* instability	0.534***	0.540***	1.257***	0.559***	0.605***	0.661**
	(4.08)	(3.65)	(2.98)	(4.62)	(3.60)	(2.44)
lag dependent variable	0.087	0.070	0.339**	0.254*	0.126	0.346
	(0.53)	(0.36)	(2.18)	(1.78)	(0.82)	(1.23)
Initial GDP *per capita*	0.474	0.303	−0.243	−0.745*	−0.473	2.015
	(1.12)	(0.77)	(0.11)	(1.92)	(1.22)	(0.58)
Trade openness	0.015	0.039	0.054	0.036	0.049*	0.031
	(0.68)	(1.60)	(1.64)	(1.61)	(1.67)	(0.93)
Government consumption (% GDP)	−0.051	−0.222	0.038	0.124	0.095	0.041
	(0.29)	(0.93)	(0.13)	(0.78)	(0.51)	(0.12)
Financial openness	−0.029	−0.388	1.405	1.425	4.335**	0.637
	(0.02)	(0.21)	(0.75)	(0.76)	(2.14)	(0.42)
(Financial openness)^2	−0.033	−0.060	−0.522	−0.130	−0.889**	−0.300
	(0.10)	(0.15)	(1.31)	(0.33)	(2.11)	(0.79)
Constant	2.736	5.719	−6.309	3.559	1.189	−13.438
	(0.92)	(1.07)	(0.50)	(1.13)	(0.27)	(0.53)
Observations	256	256	256	273	273	273
Countries	75	75	75	76	76	76
Joint significance of remittances (*p*-value)	..	0.044	0.029	..	0.066	0.049
AR(1): *p*-value	0.101	0.252	0.034	0.009	0.085	0.093
AR(2): *p*-value	0.440	0.200	0.416	0.159	0.200	0.273
Hansen *p*-value	0.758	0.691	0.773	0.519	0.556	0.417
Instruments	20	22	28	22	24	26

Note: the estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients.

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

sures of the level of financial development (Table 7). Two commonly used indicators were tested: the bank deposit ratio (column 1) and the broad money ratio (M2/GDP, column 2). Whatever indicators used, the result that the marginal stabilizing impact of remittances decreases with the level of financial development still held. Moreover, the level of financial development negatively affected consumption instability in all specifications.

Second, two alternative measures of remittances were employed: real remittances *per capita* (log-scaled) and remittances net of employee compensation (% of GDP). [19] The results are presented in the Table 8. The first three columns concern the real remittances *per capita*. In column 1, it appears that the stabilizing impact of remittances on consumption is still preserved even with the alternative measure. In column 2, the decreasing marginal stabilizing impact of remittances with increased financial development seen previously still holds. In column 3, the contribution of remittances as an insurance mechanism caught by the coefficient of the interaction term of remittances with GDP *per capita* instability remains highly significant. The last three columns repeat the same exercise with remittances net of employee compensation. The results are qualitatively unchanged.

6. CONCLUDING REMARKS

This paper analyzed the relationship between migrants' remittances and consumption instability. Using a large sample of developing countries over the period 1975–2004 and controlling for the endogeneity of remittances, the econometric results suggest that remittance–recipient countries exhibit on average lower consumption instability. Remittances appear to be a hedge against various types of macroeconomic instability: natural disaster, agricultural shocks, discretionary fiscal policy, systemic banking crisis, and exchange rate instability. However, the results highlight some important heterogeneities among recipient countries: the marginal stabilizing impact of remittances significantly decreases with the levels of financial development and remittance ratios. More precisely, the stabilizing impact is weakened when the private credit ratio exceeds 20% of GDP and when the remittance ratio is above 6% of GDP.

The stabilizing impact of remittances enters the debate about the effect of economic financial globalization on macroeconomic volatility and welfare. Previous papers have primarily focused on the effect of financial and trade openness on consumption instability (Dell'Ariccia et al., 2008; Di Giovanni & Levchenko, 2009; Kose et al., 2003; Rose & Spiegel, 2009). In this paper, we examined another aspect of economic globalization by looking at the effects of remittances on consumption instability. The paper suggests that some countries enjoy much greater stabilization from remittance inflows than others. This complexity must be factored into any analysis of the developmental implications of remittances and cautions against naïve recommendations in favor of huge remittance inflows in all situations.

NOTES

1. The literature on macroeconomic determinants of output instability in developing countries has pointed out four main factors: financial sector development (Ahmed & Suardi, 2009; Easterly, Islam, & Stiglitz, 2000); trade and financial openness (Di Giovanni & Levchenko, 2009; Kose et al., 2003); and fiscal policy (Fatas & Mihov, 2003).

2. Giuliano and Ruiz-Arranz (2009) have tested the nonlinear impact of remittances on growth conditional to the financial development. They found that remittances increase economic growth more in less financially developed countries.

3. Two arguments justify the use of the standard deviation of growth rates as a measure of instability. First, given that macroeconomic variables are often nonstationary, computing the growth rate is a way to remove the trend. Second, it is now common in the macroeconomic consequences of remittances literature to approximate instability by the standard deviation of the growth rate (e.g. Bugamelli & Paternò, 2009b; Chami et al., 2008; IMF, 2005).

4. The definition of variables, sources of data and descriptive statistics are presented in Appendix.

5. This effect strongly differs from what we can expect in developed countries where government spending is often countercyclical rather than procyclical, as it is in developing countries.

6. The paper uses the System-GMM estimator developed by Blundell and Bond (1998) for dynamic panel data with the Windmeijer (2005) correction for finite sample bias.

7. In all specifications, only period dummies and initial GDP per capita are taken as strictly exogenous.

8. Chami et al. (2008) first computed this instrument for migrants' remittances. They retained the ratio of remittances to GDP for all other recipient countries as an instrument. We followed their work, but we retained the remittances of all other neighbors. This variable captures various trends in remittances throughout regions of the world, including changes in transactions costs, and at the same time should not directly affect consumption instability. The instrument excludes the remittance-to-GDP ratio of the country in question, thereby freeing it of a direct causal link with other domestic macroeconomic and policy variables that also influence consumption instability. We also computed the GDP per capita in the migrants' host countries by weighting the GDP per capita of all other countries by the share that each of these countries represents in the emigration of workers of developing countries. The bilateral migration matrix used to make calculations was drawn from the World Bank web site: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,contentMDK:21154867~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html.

9. The coefficient obtained with the OLS estimator is, in absolute value, 50% of the corresponding coefficient obtained with System-GMM. Even when the model is estimated with the full set of control variables (column 8), this bias still remains.

10. We thank an anonymous referee who suggested expanding the set of shocks by including financial crisis, inflation and exchange rate shocks.

11. For each type of shock, M is the residual of an OLS regression with two fixed effects (country and period) for GDP per capita instability on the corresponding shock (Sh). Although M is a generated variable, there is no problem of statistical inference, given that this variable is a residual (Pagan, 1984).

12. The Center for Research on the Epidemiology of Disasters (CRED) has collected and made publically available worldwide data on the occurrence and effects of natural disasters from 1900 to the present. The database is compiled from various sources, including UN agencies, nongovernmental organizations, insurance companies, research institutions and press agencies. The EM-DAT data are publicly available on CRED's web site at: www.cred.be.

13. These disasters can be grouped into several categories: meteorological disasters (floods, wave surges, storms, droughts, landslides, and avalanches); climatological disasters (disasters caused due to long run or seasonal climatic variability such as drought, extreme temperatures, and wild fire); and geophysical disasters (earthquakes, tsunamis, and volcanic eruptions).

14. Current output growth was instrumented with two lags of GDP growth and lagged inflation. We included inflation to ensure that the results were not driven by high-inflation episodes in which the co-movement between real government spending and output might be due to monetary instability rather than fiscal policy. Inflation squared was included to control for a possible nonlinear relationship between inflation and spending. The model was estimated for each country separately.

15. In Section 5, we mobilize alternative measures of financial development to check the robustness of the nonlinearity assumption.

16. We thank an anonymous referee for providing us with explanations of this result.

17. Another approach might consist of estimation using the Hansen methodology with the assumption that the threshold variable is exogenous. Private credit ratio cannot be considered as strictly exogenous, however.

18. The stabilizing impact is weaker in the following countries: Albania, Armenia, Cape Verde, Dominica, Dominican Republic, Egypt, El Salvador, Jordan, Lesotho, Moldova, Morocco, Swaziland, and Vietnam. These countries exhibit a median value for consumption instability that is 1.5 times larger than the median value for the rest of the sample.

19. Remittances in nominal US dollars were converted to constant dollars by dividing the series by the consumer price index of each country.

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APPENDIX DESCRIPTIVE. STATISTICS, DATA DEFINITIONS, AND SOURCES

Definitions *of variables and sources*

Consumption instability: Standard deviation of the real household consumption *per capita* growth rate estimated over a nonoverlapping 5-year period. Household consumption *per capita* was drawn from World Bank tables, World Development Indicators (2009) (see Table 9).

Gross domestic product per capita: Logarithm of the GDP *per capita*. Data are in constant 2000 US dollars (World Development Indicators, 2009).

Trade openness: Sum of exports and imports of goods and services measured as a share of gross domestic product (World Development Indicators, 2009).

Remittances: Ratio of workers' remittances and compensation of employees to GDP. Workers' remittances and compensation of employees comprised current transfers by migrant workers and wages and salaries earned by nonresident workers. Workers' remittances were classified as current private transfers from migrant workers who were residents of the host country to recipients in their country of origin. They included only transfers made by workers who have been living in the host country for more than a year, irrespective of their immigration status. Compensation of employees is the income of migrants who had lived in the host country for less than a year. Migrants' transfers were defined as the net worth of migrants that is transferred from one country to another at the time of migration for those who are expected to remain in the host country for more than 1 year. (World Development Indicators, 2009).

Private credit ratio: Private credit by deposit money banks to GDP ratio (Beck, Demirgüç-Kunt, & Levine, 2000, Financial institutions and markets across countries and over time: data and analysis, World Bank Policy Research Working Paper No. 4943, May 2009).

Bank deposit ratio: Deposits by deposit money banks to GDP ratio (Beck et al., 2000, financial institutions and markets across countries and over time: data and analysis, World Bank Policy Research Working Paper No. 4943, May 2009).

Financial openness: Defined as 2+KAOPEN, where KAOPEN is the Chinn–Ito Financial Openness Variable (Chinn and Ito (2008), "A New Measure of Financial Openness"). This index takes on higher values for countries more open to cross-border capital transactions. KAOPEN utilizes four major categories of restrictions on external accounts: (1) the presence of multiple exchange rates; (2) restrictions on the current account transactions; (3) restrictions on the capital account transactions; (4) requirements for surrender of export proceeds.

Aid: Ratio of foreign aid to Gross National Income (GNI). Aid includes both official development assistance (ODA) and official aid. Ratios are computed using values in US dollars (World Development Indicators, 2009).

Government consumption: Ratio of government consumption divided by the GDP (World Development Indicators, 2009).

Discretionary fiscal policy: Standard deviation of the residual component of the log difference of government consump-

Table 9. *Descriptive statistics*

Variables	Obs	Mean	Std. Dev.	Min	Max	1st order autocorrelation coefficient
Instability of household consumption *per capita*	434	6.49	5.42	0.20	43.67	0.56*
Remittances (% GDP)	513	3.98	8.30	0	80	0.92*
Remittances *net* of compensations (% GDP)	550	2.31	4.52	0	33.15	0.90*
Real remittances *per capita* $US	452	79.13	179.42	0	1345.62	0.64*
Private credit ratio	523	22.35	18.93	0.41	145.31	0.89*
Private banks deposit (% GDP)	528	26 .84	20.20	0	121.23	1.08*
M2 (% GDP)	626	34.44	24.47	4.10	198.24	1.07*
GDP *per capita* instability	600	4.09	3.37	0.25	32.19	0.31*
Discretionary fiscal policy	425	10.74	11.44	0.77	91.69	0.58*
Agricultural value added instability	553	9.92	8.07	0.48	61.38	0.38*
Inflation instability	521	63.50	523.70	0.13	9803.13	0.07
NEER instability	519	11.85	17.78	0.61	208.60	0.10*
Natural disasters	738	1.82	4.05	0	31.76	0.17*
Financial and banking crisis (output losses%)	750	3.43	15.00	0	129.55	0.01
Financial and banking crisis (dummy variable)	750	0.13	0.34	0	1	−0.07
Initial GDP *per capita* (log)	625	6.77	1.06	4.44	9.02	0.98*
Trade openness	645	73.27	39.43	2.35	226.87	0.92*
Financial openness	629	1.51	1.18	0.18	4.53	0.81*
Government consumption (% GDP)	627	15.68	6.80	2.34	54.37	0.83*
Aid (% GNI)	632	8.01	9.38	−0.02	58.05	0.81*

Countries (87): Albania, Algeria, Argentina, Armenia, Azerbaijan, Bangladesh, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Cape Verde, Chile, China, Colombia, Comoros, Costa Rica, Cote d'Ivoire, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Honduras, India, Indonesia, Iran, Jordan, Kazakhstan, Kenya, Lebanon, Lesotho, Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Morocco, Mozambique, Namibia, Nicaragua, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Romania, Russia, Rwanda, Senegal, Seychelles, Slovak Rep., South Africa, Sudan, Swaziland, Syrian A.R., Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe.
* Significant at 5% level.

tion from an econometric model of the former over the log difference of GDP, with a time trend and inflation in a quadratic form (Fatas & Mihov, 2003). Current output growth was instrumented with two lags of GDP growth and lagged inflation. We included inflation to ensure that the results were not driven by high-inflation episodes in which the comovement between real government spending and output might be due to monetary instability rather than fiscal policy. Inflation squared was included to control for a possible nonlinear relationship between inflation and spending. The model was estimated for each country separately.

GDP per capita growth instability: Standard deviation of GDP *per capita* growth rate estimated over nonoverlapping 5-year periods (World Development Indicators, 2009).

Inflation instability: Standard deviation of the consumer price index growth rate estimated over nonoverlapping 5-year periods (World Development Indicators, 2009).

NEER instability: Standard deviation of the nominal effective exchange rate index growth rate estimated over nonoverlapping 5-year periods (World Development Indicators, 2009).

Natural disasters: The reported measure of the total number of people affected by natural disasters. The number of people affected is divided by the total population in the year prior to the disaster year (Center for Research on the Epidemiology of Disasters (CRED), Emergency Events Database (EM-DAT)).

Agricultural instability: Standard deviation of the agricultural value added growth rate estimated over nonoverlapping 5-year periods (World Development Indicators, 2009).

Financial and systemic banking crisis: Two conditions needed to be met for a banking crisis to be considered systemic: (1) significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and bank liquidations); and (2) significant banking policy intervention measures in response to significant losses in the banking system (liquidity support, bank restructuring, bank nationalizations, guarantees on liabilities, asset purchases, deposit freezes, and bank holidays) (Laeven & Valencia, 2010).

Financial and systemic banking crisis, output losses: Computed as the cumulative sum of the differences between actual and trend real GDP over the period $[T, T + 3]$, expressed as a percentage of trend real GDP, where T the starting year of the crisis. Trend real GDP is computing by applying an HP filter (with $\lambda = 100$) to the log of real GDP series over $[T - 20, T - 1]$ (Laeven & Valencia, 2010).