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by Matteo Bugamelli and Francesco Paternò

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OUTPUT GROWTH VOLATILITY AND REMITTANCES

by Matteo Bugamelli* and Francesco Paternò*

Abstract

Since output growth volatility has negative effects on growth, poverty and welfare, especially in poorer countries, it is crucial to identify the country-specific factors that affect it. The empirical literature has focused mostly on financial development, policy distortions and globalization variables. Among the latter, attention has been directed in particular to trade and financial openness. We contribute to this literature by adding what we see as the missing globalization variable, the one related to the increasingly important phenomenon of international migrations, namely emigrants' remittances. Remittances can help reduce output growth volatility thanks to their considerable magnitude, stability and low pro-cyclicality. Applying an empirical framework taken from the existing literature to a sample of about 60 emerging and developing economies over the period 1980-2003, we provide robust evidence that remittances are negatively correlated to output growth volatility. Instrumental variable estimation supports our intuition about the direction of causality.

JEL Classification: E32, F22, J61, O1.

Keywords: output growth volatility, workers' remittances, compensation of employees, financial development, financial openness.

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*Bank of Italy, Economics, Research and International Relations.

E-mail: matteo.bugamelli@bancaditalia.it; francesco.paterno@bancaditalia.it

1. Introduction¹

The volatility of real per capita GDP growth rate (henceforth, output growth volatility) has gained the centre of the stage among economists and policy-makers in the light of evidence showing that it has negative effects on growth, poverty and welfare, especially in poorer countries. This interest further increased after finding that the growth effects of output growth volatility differ according to “globalization” variables, like trade and financial integration (Kose, Prasad and Terrones, 2006). It has therefore become increasingly important to identify the factors affecting output growth volatility.

For advanced countries, the empirical literature has been trying to understand why output growth volatility has fallen during the past twenty years². The results have largely supported the view that the diffusion of ICT equipment, by enhancing efficiency in inventory management, has slashed output growth volatility, especially through investment, the more volatile component of aggregate demand. As pointed out by IMF (2005), volatility in emerging and developing economies is driven mostly by country-specific factors that dominate over global and regional shocks: empirical research has highlighted the role of financial development, institutional quality, trade and financial openness.

This paper focuses on an unexplored factor: migrants’ remittances. On one side, remittances are the missing globalization variable, the one related with the increasingly relevant phenomenon of international migrations. On the other, their good properties in terms of size, stability and low pro-cyclicality makes them potentially capable of exerting positive economic effects in recipient countries.

According to the most recent statistics by the World Bank, between 1990 and 2005 migrants’ remittances – as given by the sum of two balance of payments items (workers’ remittances and compensation of employees) – towards emerging and developing economies grew from 31 billion US dollars (1.2 per cent of such economies’ GDP) up to 192 billion

¹ We wish to thank Francesco Caselli, Paola Caselli and participants at the LACEA-LAMES Conference (Mexico City, 2-4 November 2006) for their useful comments. We also thank Dennis Quinn for kindly providing their measure of financial openness. We are responsible for all remaining errors. The views expressed in the article are those of the authors and do not involve the responsibility of Bank of Italy. Address correspondence to: Bank of Italy, Economics and International Relations: Via Nazionale, 91 – 00184 ROME (Italy). E-mail: matteo.bugamelli@bancaditalia.it; francesco.paterno@bancaditalia.it

² Cecchetti et al. (2006) identify five different categories of explanations: i) changes in inventory control policies; ii) monetary policy; iii) financial innovations; iv) international openness; v) smaller shocks.

(2.0 per cent of GDP). Workers' remittances have been outpaced only by net inflows of foreign direct investments, which grew from 24 billion in 1990 to 281 billion in 2005 (from 0.8 to 2.9 per cent of GDP). In our sample the average cross-country correlation between remittances and per capita GDP, both Hodrick-Prescott filtered, is low (0.08 over the period 1980-2003; fig. 1a), although heterogeneous across countries. We deem that this degree of pro-cyclicality can make remittances play a stabilising role in the recipient economy, if remittances are an alternative source of funding for both household consumption and firms' investment as already pointed out by Giuliano et al. (2006). Indeed the average cross-country correlation between credit to the private sector and per capita GDP is equal in the same period to a much higher 0.20 (fig. 1b).

The goal of this paper is to test whether remittances (in terms of GDP) can indeed reduce output volatility as speculatively hypothesized by the IMF (2005): “[...] *the relatively stable and a-cyclical nature of remittances suggests that countries with access to significant remittance inflows may be less prone to damaging fluctuations, whether in output, consumption or investment*”. Within the (cross-country) empirical framework traced by previous papers on output growth volatility, we confirm the above intuition for a sample of about 60 emerging and developing economies over the period 1980-2003. The negative relationship between migrants' remittances and output growth volatility is robust to different sets of explanatory variables – which include trade and financial openness, financial development and monetary policy – and to different measures of remittances. We also exclude that the result is driven by the negative effect of remittances on the probability of financial crises (Bugamelli and Paternò, 2005).

The estimated relationship between remittances and output growth volatility can be plagued by endogeneity. The stock of migrants and their propensity to remit can indeed be sensitive to the economic conditions (among which, output growth volatility) in the country of origin: a larger output growth volatility discourages investment-financing remittances while boosts consumption-financing (altruistic) remittances. Greater output instability in the country of origin can induce larger migration outflows and therefore larger remittance inflows. This is to say that endogeneity bias can in theory tilt our OLS results in either directions.

To address this issue, we turn to instrumental variable estimation. Since the total amount of remittance inflows (in absolute terms) is a function of the stock of migrants and the per capita level of remittances, we search for exogenous determinants of migrations and

propensity to remit. As to migrations, Mayda (2007) shows that distance between the source and the host country, by increasing migrations costs, decreases the number of emigrants. In the absence of bilateral data on remittance flows, we instrument remittances with the geographical latitude of the country of origin as our (inverse) measure of distance, under the reasonable hypothesis that migrants originate in the southern part of the globe and are attracted by the richer North. Since gravity models use distance and latitude as determinants of trade and other financial flows, one could object that our strategy violates the exclusion restrictions. We claim that this is not the case in our analysis since we carefully control for all possible globalization channels; in other words, conditional on trade and other financial international flows exclusion restrictions are not violated.

In a second IV specification, we use latitude and destination countries' GDP growth rate. The latter variable, already used by Aggarwal et al. (2006), is in our view an exogenous determinant of the propensity to remit, that is unrelated to migrants' preferences that could instead vary with economic conditions in the country of origin. Here again the satisfaction of the exclusion restrictions is guaranteed by the fact that we already control for other factors (trade and financial flows) through which economic shocks are diffused internationally. To compute this second instrument, that following Mayda (2007) can also be seen as a relevant pull factor for migrations, we use a detailed database on bilateral migration stocks recently built by Parsons et al. (2005). In this regard, we provide a better measure than the one computed by Aggarwal et al. (2006) on the basis of only the top five OECD host countries for each remittance-recipient country.

The IV analysis proves that the negative effect of remittances on output growth volatility is a causal one.

Our results interestingly add to the analysis of the macroeconomic effects of remittances in two ways. On one side, combining the evidence provided here with Bugamelli and Paternò (2005) it emerges a clear and robust role of remittances in terms of macroeconomic stability. On the other side, being output growth volatility negatively correlated with growth, our results complement and reinforce the growth-enhancing effect of remittances detected by Giuliano and Ruiz-Arranz (2006). An interesting by-product of our analysis concerns the potential (de-)stabilising role played by financial openness: relying on various measures of it (both *de facto* and *de jure*), we find only weak evidence supporting a positive impact on output growth volatility. The other results are largely consistent with the

previous literature: trade openness and monetary policy volatility increase output growth volatility, while financial development decreases it (in a nonlinear way).

The rest of the paper is structured as follows. In the next section we briefly discuss the related literature on volatility and migrants' remittances. Data are described in section 3. The next two sections present the results based on OLS and IV, respectively. The last section concludes.

2. Related literature

The relevance of output and consumption volatility - whose correlation would be removed only by financial markets completeness - is a point of economic debate. Robert Lucas in his Presidential Address to the American Economic Association in 2003, argued that the level of consumption volatility in the United States, resulting from the optimising behaviour of economic agents, is so low that, under reasonable assumptions about the risk aversion parameter, its removal would induce a much limited welfare gain. Within Lucas' framework, consumption volatility is mainly driven by the volatility of technological shocks that are assumed to affect output fluctuations, but not its trend growth rate. In an alternative view, output growth may depend on output growth volatility so that welfare gains from reducing volatility would descend not only from its direct effect, but also indirectly through the effects on growth. At the theoretical level, various models outline a negative relationship (Aizenman and Marion, 1993; Ramey and Ramey, 1991; Aghion and Banerjee, 2005). Empirically, the seminal paper by Ramey and Ramey (1995) confirms this intuition within a cross-section sample of 92 countries over the period 1962-85. With a social welfare function in mind, volatility may matter not only *per se* and for its depressing effects on growth, but also because of its potential impact on poverty³.

Once accepted the relevance of volatility in terms of welfare, growth and poverty, the empirical literature has started focusing on its determinants. The seminal paper is by Easterly, Islam and Stiglitz (2000) who emphasise, in a sample of advanced and developing countries, the development of a deep financial system as a key factor for volatility. More precisely, they find a robust quadratic relationship implying that financial system deepening reduces the volatility up to a given threshold after which further deepening raises it. They

³ This is a consequence of the fact that recessions increase poverty significantly, while expansions decrease it in a more limited way (Agenor, 2002)

also document a positive influence of trade openness on volatility which is rationalized considering that trade integration leads to more specialised economies and therefore to greater exposure to product-specific shocks. Finally, they reject the hypothesis that higher real wage flexibility is associated with lower output growth volatility.

Kose, Prasad and Terrones (2003) shift the focus from output growth volatility to the ratio between consumption and income volatility. In a sample of advanced and developing countries, they find a quadratic relationship between relative volatility of consumption and the degree of financial openness: the latter increases the former one up to a given level of financial openness after which any further increase lowers volatility. They also find a negative relationship between trade openness and the relative volatility of consumption. Also Buch, Doepke and Pierdzioch (2005) investigate the link between financial openness and business cycle volatility: in their theoretical model financial openness magnifies output fluctuations due to monetary policy shocks, while it dampens those due to fiscal policy shocks. Their empirical analysis, based on 24 advanced economies, confirms these hypotheses, even if the results emerge only when the sample period is restricted to the 1990s.

Acemoglu, Johnson, Robinson and Thaicharoen (2003) focus on the role of distortionary macroeconomic policies (e.g., high inflation, large budget deficits and misaligned real exchange rates) and the institutional framework, as proxied by the variable “constraint on the executive”. In a sample of only developing countries, their main result is that the significant positive influence of distortionary macroeconomic policies on growth volatility is almost entirely reflecting a deeper problem, that is the weakness of the institutional framework. More precisely, they show that the latter may indeed be the determinant of both growth volatility and bad distortionary macroeconomic policies.

Set against a broad theoretical analysis on the economic impact of remittances on the recipient countries, thoroughly surveyed by Docquier and Rapoport (2006), empirical studies still lag behind and have mostly focused on growth, inequality and poverty, leaving issues of macroeconomic stability largely uninvestigated.

Convincing evidence on the poverty reducing role played by remittances has been produced by cross-country studies (Adams and Page, 2003; IMF, 2005) and, above all, by micro-econometric analyses based on household-level data (Adams 2004 and 2005 for Guatemala; Taylor et al., 2005 for Mexico; Yang and Martinez, 2005 for Philippines). The same result is found by López-Córdova (2006) using a cross-section of Mexican

municipalities. On the basis of recent and quite accurate evidence, surveyed by López-Córdova and Olmedo (2006), the positive impact of remittances on education and health at the household-level is at this stage widely acknowledged⁴. However, according with another perspective, the impact of remittances on education can not be considered equivalent to the overall impact of migration. Adopting this more general approach, McKenzie and Rapoport (2006) show indeed that living in a migrant household lowers the chance that boys complete junior high school and both boys and girls complete high school in Mexico. A few studies document the positive impact of remittances on entrepreneurship in migrants' origin households (Woodruff and Zenteno, 2004; Yang, 2008), while few others show that migrants' capital transfers enhance the probability that return migrants accede to entrepreneurship, as savings accumulated abroad allow them to overcome liquidity constraints (McCormick and Wahba, 2001; Dustmann and Kirchkamp, 2002).

Few scholars have run cross-country growth regressions with mixed and not always convincing results. Faini (2004) finds a positive, but not very robust, relationship between growth and remittances, while Chami et al. (2003) find the opposite. Using instrumental variables to account for the potential endogeneity of remittances, IMF (2005) finds no statistically significant relationship. Giuliano and Ruiz-Arranz (2006)⁵ show that the growth-enhancing effect of remittances emerges only when remittances are allowed to have both a direct and an indirect effect. When interacting remittances with an index of financial development, they find that remittances and the deepness of the financial system act as substitute factors, i.e. workers' remittances do exercise a significant growth-stimulating effect only in countries with shallower financial systems.

The first attempt to link remittances and macroeconomic stability appears in IMF (2005), which finds lower volatility of aggregate output, consumption and investment in countries with larger remittance inflows. In a previous paper (Bugamelli and Paternò, 2005), we proved that large remittance inflows reduce the probability of current account reversals.

⁴ Cox Edwards and Ureta (2003) on education in El Salvador; López-Córdova (2006) and McKenzie and Rapoport (2005) on education in Mexico; Adams (2005) on education in Guatemala; Yang (2008) on education in the Philippines. Amuedo-Dorantes et al. (2007), López-Córdova (2006), McKenzie (2005) and Hildebrandt and McKenzie (2005) on health in Mexico.

⁵ They use a much wider (in terms of number of countries) database of remittances resulting from their direct acquisition of data through contacts with IMF desk economists and country authorities.

3. Data

Output growth volatility is defined for each country as the standard deviation of the annual growth rate of real per capita GDP (measured in constant 2000 US\$, the same used by Easterly, Islam and Stiglitz, 2000) across the period 1980-2003. Output data, as most of the others, are drawn from the World Development Indicators (2005) database, published by the World Bank. Our main explanatory variables can be classified into four main categories: i) globalization; ii) financial sector development; iii) monetary policy distortion and volatility; iv) others. Unless otherwise indicated, all variables are computed as cross-time country means.

Globalization variables include: trade openness (sum of exports and imports over GDP), volatility of annual changes in terms of trade (only goods), financial openness and migrants' remittances. Since the empirical literature has not reached an agreement on the better-suited measure of financial openness⁶, we use four different *de facto* measures: i) gross capital flows in percentage of GDP; ii) stock of foreign liabilities (taken from the database built by Lane and Milesi-Ferretti, 2006) in percentage of GDP; iii) net financial inflows in percentage of GDP; iv) net FDI inflows in percentage of GDP. We also use a *de jure* measure of financial openness, elaborated by Quinn and Toyoda (2008)⁷.

As far as migrants' remittances are concerned, we use the sum of workers' remittances and compensation of employees, as a percentage of GDP. Workers' remittances properly refer to current transfers by migrants who are employed and resident in the countries where they migrated (destination country). Compensation of employees should instead comprise wages, salaries and other benefits earned by individuals in countries different from their resident country (country of origin) and for work performed for and paid for by residents of the destination countries; typically, this item includes seasonal and other short term workers (less than one year) and border workers who keep the centre of their economic interest in their country of origin (IMF, 1993). We use the sum of the two items because, as pointed in the Balance of Payments Statistics Yearbook, some countries are not capable of distinguishing workers' remittances from compensation of employees. As an important by-product, data on compensation of employees, available on the World Development

⁶ Kose, Prasad, Rogoff and Wei (2006) are in favor of gross capital flows and the sum of gross stock of foreign assets and liabilities.

⁷ They take into account restrictions on residents and non-residents and weigh severity of restrictions across all categories of financial flows.

Indicators database, cover a larger set of countries and thus allows to enlarge the country coverage of the dataset. However, we will have care of proving that our results are still valid when using only workers' remittances.

Financial sector development is captured by the credit to the private sector in terms of GDP. Monetary policy distortion and volatility measures include (log) inflation and the volatility of changes of M2/GDP. The last one is, in our opinion, the most appropriate measure of volatility of monetary policy impulses since it captures unanticipated changes of money supply (anticipated ones are translated into prices, leaving unchanged the M2/GDP ratio).

Other variables are used in the empirical analysis. In particular, the level of development of any country is caught by (the log of) beginning of period per capita GDP and the agricultural share of GDP. Institutional quality is measured by the PRS Group's IRIS III dataset as described in Knack and Keefer (1995); the frequency of current account reversals is taken from Bugamelli and Paternò (2005)⁸; government consumption/GDP is taken from World Bank; a real overvaluation index computed as country's time average of the index initially elaborated by Dollar (1992) and later on updated by Easterly; using the Armed Conflict Dataset⁹ we define a dummy variable which is equal to 1 if a country experienced in a given year a conflict with more than 1,000 battle deaths.

For the IV estimates, we resort to a recently published dataset, elaborated by Parsons, Skeldon, Wamsley and Winters (2005), that provides data on the country of origin's distribution of migrants by destination country. Combining these data with IMF data on country-level GDP we computed for each origin country a weighted average of destination countries' GDP growth rate. From the CEPII dataset (www.cepii.fr) we take the country of origin's latitude.

In the trade-off between focusing only on variables available for the entire period 1980-2003 and maximizing the number of explanatory variables, we have chosen to work with those countries displaying at least 10 annual observations for each of the relevant variables. After restricting to developing and emerging economies with a population larger

⁸ A current account reversal at time t is identified through the following conditions: a) the current account balance at time $t-1$ must be a deficit; b) the current account balance must improve by at least 5 percentage points of GDP at time t ; c) the size of the improvement must exceed one half of the current account balance at time $t-1$.

⁹ It is a comprehensive new database of civil conflicts developed by the International Peace Research Institute of Oslo and the University of Uppsala (Strand et al., 2004) and focusing only on politically motivated violence.

than 200,000 people as of 2002 and dropping countries with remittances below the 1st percentile and above the 99th percentile, we end up with 55 countries¹⁰. Descriptive statistics are reported in Table 1.

4. Results: OLS

We estimate the following cross-sectional model:

$$\text{outputgrowthvolatility}_i = \alpha + \beta_1 * \left(\frac{REM \& COM}{GDP} \right)_i + Z_i' \gamma + \varepsilon_i \quad (1)$$

where the vector Z contains country-level controls that cover all the variables proved to be relevant for output growth volatility in previous empirical studies. To appreciate the contribution of each set of controls, we follow an incremental approach. In this process, the explanatory power of the regressions grows from 26 up to a maximum of 60 per cent.

In Table 2 we include basic controls for economic development (log of beginning of period per capita GDP¹¹ and the value added share of agriculture), financial development (measured by the amount of credit to the private sector in terms of GDP), volatility of monetary policy impulses (as caught by the volatility of changes of M2/GDP) and inflation, used as a measure of monetary policy distortion. In all regressions, migrants' remittances dampen output growth volatility by a statistically significant amount. The estimated coefficients of the other control variables are consistent with our priors: i) the volatility of monetary policy impulses significantly enhances output growth volatility; ii) the existence of a quadratic relationship between financial development and output growth volatility, one of the main results reported by Easterly, Islam and Stiglitz (2000), is confirmed; iii) output growth volatility is smaller in more developed economies and larger in more agricultural ones; in both cases, though, the effect is not statistically significant.

Globalization enters in Tables 3 and 4. As in Easterly, Islam and Stiglitz (2000), trade openness exerts a significant and positive impact on output growth volatility (Table 3:

¹⁰ Algeria, Bangladesh, Barbados, Belize, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, China, Colombia, Republic of Congo, Costa Rica, Côte d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, India, Indonesia, Jamaica, Madagascar, Malawi, Mali, Mauritania, Mexico, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Rwanda, Senegal, Sri Lanka, Sudan, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Vanuatu, Zimbabwe.

¹¹ This is the same functional form selected by Acemoglu et al. (2003).

columns [1], [3] and [4]). The introduction of an interaction term between trade openness and volatility of the terms of trade unveils a surprising effect of the latter one: the destabilising effect of terms of trade volatility is decreasing with trade openness¹². In Table 4 we present our fully-fledged specification that includes financial openness under 5 alternative measures, four of which capture *de facto* financial openness, the last one a *de jure* definition¹³. A statistically significant and positive impact of financial openness is obtained only with the stock of foreign liabilities over GDP and net FDI inflows/GDP (columns [3] and [4]); the quadratic relationship implies that increasing financial openness first raises and then decreases output growth volatility (column [7]).

As a general picture, the negative influence of remittances on output growth volatility is confirmed being around -0.2. A numerical example allow to better appreciate the economic significance of this figures: for a country like Tunisia, whose migrants' remittance inflows are on average equal to 4 per cent of GDP and output growth volatility to 2.7, the dampening effect is estimated to be around 0.8 percentage points, amounting to a reduction of output growth volatility in the order of 30 per cent. The quadratic influence of financial development, as well as the impact of the volatility of monetary policy impulses, trade openness, volatility of terms of trade are in line with the previous literature. The beginning of period per capita GDP remains always negative but generally not significant.

4.1 Robustness

We perform a series of robustness exercises against measurement error and omitted variable bias.

In Table 5 we estimate our fully-fledged model replacing the sum of workers' remittances and compensation of employees with workers' remittances only. This is both a test on measurement error and check on whether different features of migrants' flows are relevant. The estimates, conducted over smaller samples because of the more limited availability of workers' remittances data, confirm almost all the previous results. The impact of remittances appears slightly larger than before (Table 4). The interaction between trade

¹² This effect, though not important for our main result on remittances, is counter-intuitive. Tentatively, a possible explanation could be that more open economies are relatively more capable of re-orienting the composition of exports after an adverse terms of trade shock.

¹³ The *de jure* measure reduce the sample size by about one third.

openness and terms of trade volatility loses significance, thus suggesting that its previous counter-intuitive negative sign could be due to outliers.

Another test against measurement error is provided in Table 6. Here we restrict the sample to the last 12 years (1992-2003) when the quality of remittance data is improved and the number of countries collecting these data have significantly increased¹⁴. Results are confirmed for different measures of financial development and migrants' remittances.

Finally, we deal with the omitted variable bias by widening the set of explanatory variables to include factors that are sometimes deemed as potentially relevant in the previous literature (Table 7). In particular, we control for the occurrence of civil wars during the period 1980-2003 (col. [1]), the quality of institutions (col. [2]), the size of government consumption as a percentage of GDP (col.[3])¹⁵, the role of exchange rate fluctuations through an overvaluation index (col. [4]). All these variables are classified by Acemoglu et al. (2003), along with inflation, as factors revealing policy distortions; as such they might contribute to enhance output growth volatility. In our analysis, however, none of these variables is significantly different from zero; their inclusion does not alter our main result on migrants' remittances. Moreover, since the frequency of current account reversals is not found significant and the results on remittances are unchanged (col.[5]), we conclude that the output growth volatility dampening effect of remittances is not channelled through less likely current account reversals.

5. Results: IV

Endogeneity of remittances could be a serious issue in our empirical framework. Indeed migrants can change the amount of remittances in the face of different levels of output growth volatility. On one side, if they send money back home to finance investment activities, they might decide to reduce such transfers when the economic environment turns out (or simply is expected) to be more uncertain and risky. This would downward-bias the coefficient of remittances, spuriously buying us a negative coefficient. Increasing riskiness and uncertainty can induce the opposite effect on remittances (upward bias in OLS) when migrants send money for altruistic reasons aiming at smoothing consumption of those left

¹⁴ Variables are built requiring availability of at least 9 out of 12 annual observations.

¹⁵ We can not include a measure of volatility of fiscal policy due to the lack of data on cyclically-adjusted fiscal balances for emerging and developing countries.

behind; a positive relationship between volatility and amount of remittances can descend also when migration outflows are larger in more volatile and risky economic environments. This is to say that in principle the endogeneity bias can be either positive or negative.

We provide two IV specifications starting from the following identity:

$$\frac{REM \ \& \ COM}{GDP} \equiv \frac{stock \ of \ migrants}{population} * \frac{population}{GDP} * \frac{REM \ \& \ COM}{stock \ of \ migrants}$$

That is, our endogenous variable can be decomposed in the three terms (multiplicatively linked): the share of migrants, the inverse of GDP per capita, the per capita propensity to remit. Since we already include the GDP per capita in the regression, we need to find instruments for the other two terms, that is exogenous determinants of migrations and the propensity to remit.

To the best of our knowledge, only Aggarwal et al. (2006) propose IV instruments for remittances. To study the impact of remittances on the recipient-country's financial sector development, they use economic conditions (GDP per capita, real GDP growth rate, and unemployment rate) in the host countries as exogenous determinants of the amount of remittance inflows in the migration-origin country. For this, they build a weighted average of such conditions in the five OECD countries that are the top host economies of migrants from each of the remittance-recipient country; weights are given by the country of origin's share of migrants to each of the five host countries. We follow the same strategy and improve this measure using a more complete dataset on bilateral trade stocks, built by Parsons et al. (2005). As a measure of economic condition in the migrants' host country we use only GDP growth that, given our cross-sectional data structure, we compute as a average annual growth rate over the period 1980-2003. In our logical scheme, this instrumental variable can proxy for the propensity to remit¹⁶.

Mayda (2007) shows that bilateral distance, meant to be a proxy for migration costs, is negatively related to migration flows. In the absence of bilateral data on remittances and under the reasonable hypothesis that the most relevant direction of migration flows for emerging and developing economies is the one going from South to North, we replace bilateral distance with the geographical latitude of the country of origin. More precisely, we

¹⁶ Mayda (2007) shows that economic conditions in destination countries are a statistically significant pull factor for migration flows. In our set-up this would imply that this variable could also instrument for the stock of migrants.

use a normalized measure of latitude, given by $90 - \text{latitude}$ in degrees, that is increasing in distance from the North of the world.

We therefore propose two IV specifications: one with only latitude, the other with latitude, weighted GDP growth rates in remittance-sending countries and their interaction; the latter means to capture the multiplicative relationship between the stock of migrants and the per capita propensity to remit. A word of clarification is needed with respect to the exclusion restrictions. Since gravity models use distance and latitude as determinants of trade and other financial flows, one could object that our strategy violates the exclusion restrictions. The same critique applies to economic conditions in rich countries that spread through the same real and financial linkages into emerging and developing economies. In both cases, we believe that exclusion restrictions are satisfied in our analysis given that in the main regression we already account for trade and financial openness; in technical terms, conditional on trade and financial openness instruments are not correlated with the error term.

First stage regressions are presented in Table 8. In column [1] we use only latitude as instrumental variable. As expected a higher normalised latitude, that is a greater distance from the richest part of the world, is negatively correlated with remittances (over GDP). As measured by the partial R-squared reported in the lower part of the Table, the explanatory power of latitude is 22 percent. The F-statistics of excluded instruments is equal to 12.99, above the rule of thumb threshold of 10 recommended by Staiger and Stock (1997) to avoid weak instrument concerns. When we switch to our second model (column [2]) the results are still comforting. The explanatory power of the instrument rises to 25 percent; the test of excluded instruments is still above 10. The coefficients point to the combined effect of latitude and economic conditions in the destination countries: the positive impact of destination countries GDP growth rate on remittances - proxying for the impact on the propensity to remit - is decreasing with normalised latitude – proxying for the impact on the stock of migrants.

The IV estimation of our model of output growth volatility confirms a negative causal impact of remittances (Table 9). With both sets of instruments, the coefficient of remittances is highly significant and negative; interestingly, it is larger – 0.7 against 0.3 – than in the OLS estimations. This is consistent with both a story of a positive endogeneity bias (more remittances in more economically unstable countries) and measurement error (attenuation bias). The Hansen J test statistics – which replaces the usual Sargan test, because of the

robustness assumption incorporated in the regression - signals the validity of the two instruments.

6. Conclusions

We have provided robust evidence that remittances reduce output growth volatility in emerging and developing economies. Since output growth volatility negatively affect growth, we have found a further growth-enhancing effect of remittances that has to be added to the one identified by Giuliano and Ruiz-Arranz (2006). Moreover, combining this paper with our previous work on remittances and current account reversals (Bugamelli and Paternò, 2005), it emerges a clear and robust role of remittances in terms of macroeconomic stability. From a policy perspective, actions to reduce the cost and the risk of transferring migrants' remittances across countries remain an important part of the political agenda both at the international and national level.

Our paper also usefully adds to the debate on the relationship between globalization and volatility by showing that the effect of globalization varies with the variable under consideration; in particular, while trade openness may indeed increase output growth volatility, we have shown that remittances, a by-product of international migrations, has the opposite effect. Moreover, financial openness, probably the most relevant aspect of the globalization process in the recent years, seems to play no significant role.

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Fig.1a

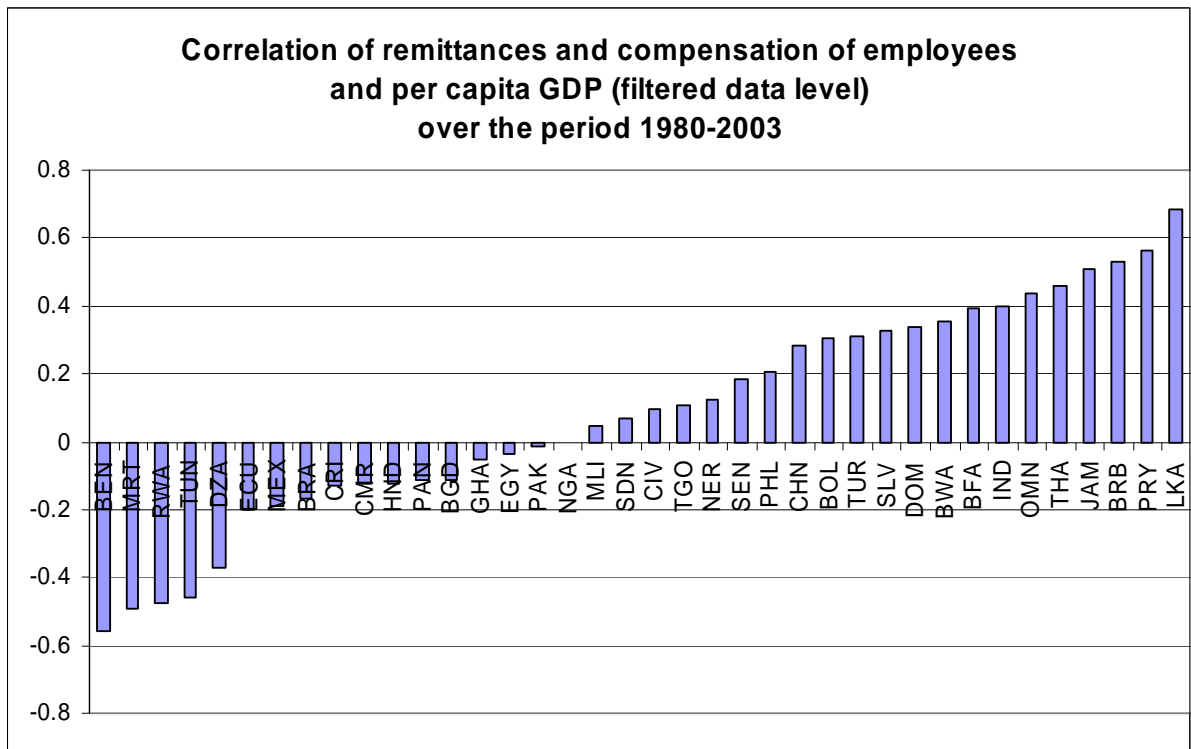
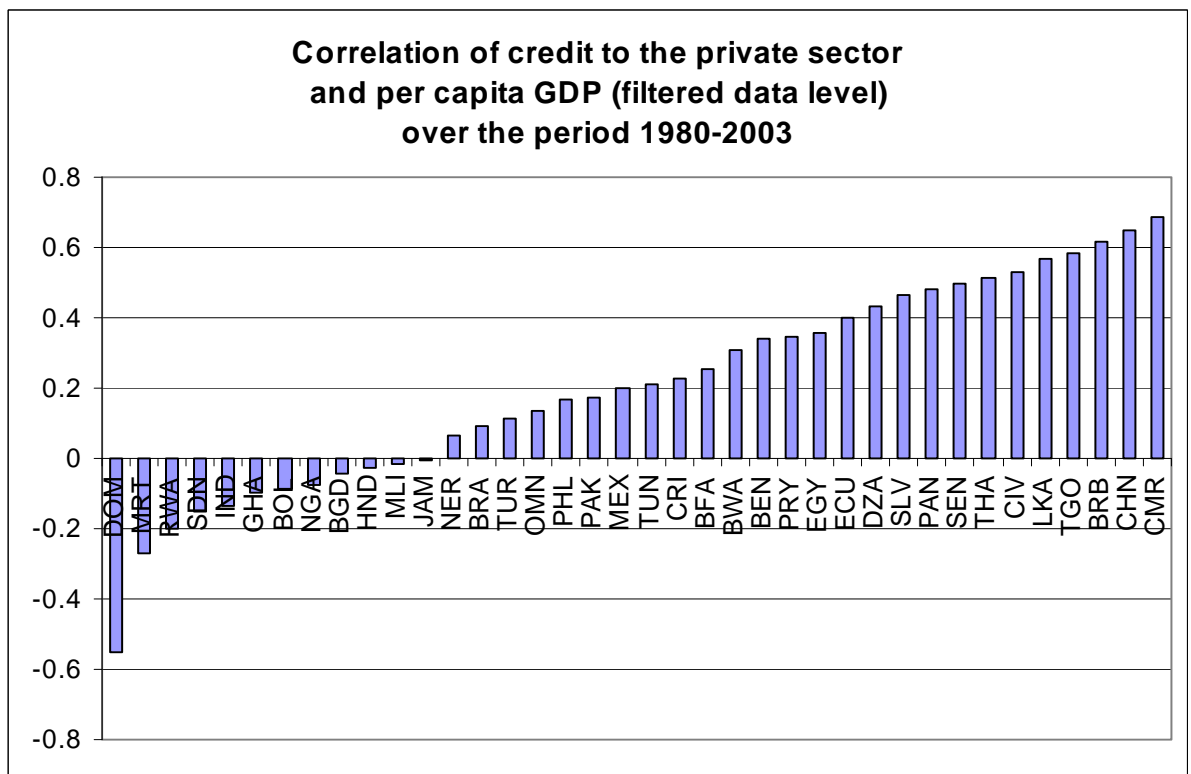


Fig. 1b



Notes: Annual time series of remittances and compensation of employees, per capita GDP (constant 2000 US\$) and credit to the private sector are filtered with Hodrick-Prescott ($\lambda=100$). The countries are those with available data over the full period under investigation (1980-2003).

Table 1**Descriptive statistics**

Variable	No. obs.	mean	std dev	Min	Max
output growth volatility	55	4.21	1.69	1.49	9.89
remittances and compensations/GDP	55	2.53	2.38	0.06	8.31
remittances /GDP	47	2.50	2.30	0.04	7.96
log inflation	55	2.56	1.42	-0.99	7.04
volatility of changes of M2/GDP ratio	55	2.81	1.80	0.75	10.45
credit to the private sector/GDP	55	24.71	15.77	5.96	90.66
trade openness	55	63.16	29.23	19.44	155.29
volatility of changes in terms of trade (only goods)	55	0.13	0.06	0.02	0.28
agricultural share of GDP	55	22.55	12.15	2.29	51.93
log (beginning of period per capita GDP, PPP)	55	7.77	0.79	6.41	9.43
all net inflows/GDP	53	1.88	4.89	-25.71	8.55
gross capital flows/GDP	55	11.62	20.43	1.53	147.49
foreign liabilities/GDP	51	93.58	64.92	26.46	373.05
net FDI inflows/GDP	54	1.69	1.40	0.06	8.24
Quinn's Capital account openness (1982)	38	34.54	16.80	12.50	100.00
Quinn's Capital account openness (average 1982-97)	38	46.16	17.37	16.67	91.67
war	55	0.27	0.45	0.00	1.00
quality of institutions	48	4.14	1.05	2.22	6.11
Government consumption/GDP	55	14.13	5.46	4.60	29.89
overvaluation index	47	114.30	62.65	41.31	434.55
frequency of current account reversals	55	0.08	0.07	0.00	0.23
destination countries' GDP growth rate	55	2.93	0.74	1.37	5.28
normalised latitude	55	81.41	17.65	50.07	115.97

Table 2**Output growth volatility: Inflation, Monetary Policy and Financial Development**

	(1)	(2)	(3)
remittances and compensations/GDP	-0.193 [0.100]*	-0.224 [0.090]**	-0.196 [0.077]**
log inflation	-0.176 [0.155]	-0.309 [0.160]*	-0.340 [0.153]**
volatility of changes of M2/GDP ratio	0.378 [0.113]***	0.485 [0.115]***	0.512 [0.114]***
credit to the private sector/GDP		-0.042 [0.012]***	-0.115 [0.046]**
(credit to the private sector/GDP)^2			0.001 [0.001]
agricultural share of GDP	0.040 [0.033]	0.011 [0.026]	0.006 [0.027]
log of beginning of period per capita GDP	-0.028 [0.459]	-0.185 [0.312]	-0.033 [0.345]
Constant	3.412 [4.223]	6.413 [2.846]**	6.392 [2.948]**
Observations	55	55	55
R-squared	0.26	0.36	0.40

Notes: OLS estimates; robust standard errors in brackets. All the variables are described in Table A1.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3

Output growth volatility: add Trade Openness

	(1)	(2)	(3)	(4)
remittances and compensations/GDP	-0.196	-0.194	-0.220	-0.225
	[0.076]**	[0.076]**	[0.072]***	[0.076]***
log inflation	-0.192	-0.193	-0.245	-0.284
	[0.177]	[0.178]	[0.162]	[0.173]
volatility of changes of M2/GDP ratio	0.487	0.487	0.548	0.667
credit to the private sector/GDP	[0.108]***	[0.109]***	[0.094]***	[0.140]***
	-0.130	-0.130	-0.143	-0.167
	[0.048]***	[0.049]**	[0.047]***	[0.041]***
(credit to the private sector/GDP) ²	0.001	0.001	0.001	0.001
	[0.001]*	[0.001]*	[0.001]**	[0.000]***
agricultural share of GDP	0.018	0.018	0.019	-0.015
	[0.027]	[0.028]	[0.026]	[0.028]
trade openness	0.016	0.013	0.018	0.056
	[0.009]*	[0.025]	[0.009]**	[0.014]***
(trade openness) ²		0.000		
		[0.000]		
volatility of changes in terms of trade (only goods)			-4.028	16.930
			[3.418]	[11.002]
trade openness* volatility of changes in terms of trade (only goods)				-0.323
				[0.144]**
log of beginning of period per capita GDP	-0.104	-0.103	-0.123	-0.364
	[0.317]	[0.320]	[0.313]	[0.252]
Constant	5.569	5.669	6.421	6.787
	[2.713]**	[2.899]*	[2.626]**	[2.098]***
Observations	55	55	55	55
R-squared	0.44	0.44	0.45	0.54

Notes: OLS estimates; robust standard errors in brackets. All the variables are described in Table A1.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4

Output growth volatility: Add Financial openness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All inflows/GDP	Gross capital flows/GDP	Foreign liabilities/GDP	Net FDI inflows/GDP	De jure (1982)	De jure (average 1982-97)	Foreign liabilities/GDP (nonlinear)
remittances and compensations/GDP	-0.246	-0.227	-0.307	-0.248	-0.232	-0.222	-0.282
	[0.077]***	[0.076]***	[0.086]***	[0.074]***	[0.101]**	[0.107]**	[0.091]***
log inflation	-0.390	-0.299	-0.359	-0.377	-0.031	-0.013	-0.430
	[0.173]**	[0.168]*	[0.174]**	[0.174]**	[0.290]	[0.288]	[0.163]**
volatility of changes of M2/GDP ratio	0.789	0.665	0.496	0.612	0.246	0.250	0.479
	[0.116]***	[0.139]***	[0.167]***	[0.139]***	[0.290]	[0.280]	[0.163]***
credit to the private sector/GDP	-0.165	-0.166	-0.173	-0.171	-0.162	-0.163	-0.178
	[0.040]***	[0.041]***	[0.044]***	[0.045]***	[0.061]**	[0.059]***	[0.046]***
(credit to the private sector/GDP)^2	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	[0.000]***	[0.000]***	[0.000]***	[0.000]**	[0.001]**	[0.001]**	[0.000]***
agricultural share of GDP	-0.032	-0.018	-0.034	-0.013	-0.073	-0.073	-0.026
	[0.026]	[0.028]	[0.028]	[0.027]	[0.038]*	[0.039]*	[0.028]
trade openness	0.060	0.053	0.060	0.055	0.078	0.077	0.042
	[0.014]***	[0.015]***	[0.022]***	[0.014]***	[0.021]***	[0.022]***	[0.027]
volatility of changes in terms of trade (only goods)	23.636	17.184	21.382	19.206	36.379	36.194	17.336
	[9.844]**	[10.971]	[11.026]*	[10.349]*	[14.451]**	[14.590]**	[12.642]
trade openness* volatility of changes in terms of trade (only goods)	-0.412	-0.335	-0.436	-0.385	-0.560	-0.557	-0.349
	[0.131]***	[0.141]**	[0.152]***	[0.135]***	[0.196]***	[0.203]**	[0.187]*
financial openness	-0.013	0.010	0.005	0.351	-0.009	-0.008	0.024
	[0.024]	[0.007]	[0.003]*	[0.166]**	[0.015]	[0.015]	[0.011]**
(financial openness)^2							-0.000
							[0.000]*
log of beginning of period per capita GDP	-0.348	-0.395	-0.356	-0.356	-0.805	-0.767	-0.057
	[0.268]	[0.252]	[0.268]	[0.282]	[0.335]**	[0.365]**	[0.331]
Constant	6.761	7.325	7.708	6.909	9.877	9.646	5.146
	[2.196]***	[2.154]***	[2.264]***	[2.177]***	[2.854]***	[2.880]***	[2.690]*
Observations	53	55	51	54	38	38	51
R-squared	0.61	0.54	0.58	0.56	0.51	0.51	0.60

Notes: OLS estimates; robust standard errors in brackets. All the variables are described in Table A1.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5

Robustness: only workers' remittances*(dependent variable: output growth volatility)*

	(1)	(2)	(3)
	Gross capital flows/GDP	Foreign liabilities/GDP	Foreign liabilities/GDP (nonlinear)
Workers' remittances/GDP	-0.266 [0.109]**	-0.310 [0.104]***	-0.282 [0.111]**
log inflation	-0.272 [0.194]	-0.350 [0.199]*	-0.459 [0.186]**
Vol. of changes of M2/GDP	0.619 [0.218]***	0.397 [0.255]	0.368 [0.248]
credit to the private sector/GDP	-0.188 [0.051]***	-0.182 [0.050]***	-0.181 [0.052]***
(credit to the private sector/GDP)^2	0.001 [0.000]***	0.001 [0.000]***	0.001 [0.000]***
agricultural share of GDP	-0.028 [0.038]	-0.034 [0.036]	-0.022 [0.036]
trade openness	0.052 [0.020]**	0.051 [0.030]	0.025 [0.040]
volatility of changes in terms of trade (only goods)	14.404 [14.268]	18.565 [15.978]	12.243 [19.462]
trade openness* volatility of changes in terms of trade (only goods)	-0.303 [0.203]	-0.384 [0.244]	-0.252 [0.311]
financial openness	0.007 [0.006]	0.006 [0.004]	0.030 [0.015]*
(financial openness)^2			-0.000 [0.000]*
log of beginning of period per capita GDP	-0.412 [0.401]	-0.201 [0.438]	0.172 [0.498]
Constant	8.377 [4.093]**	7.230 [4.221]*	4.091 [4.501]
Observations	47	43	43
R-squared	0.48	0.51	0.55

Notes: OLS estimates; robust standard errors in brackets. All the variables are described in Table A1.
 significant at 10%; ** significant at 5%; *** significant at 1%

Table 6**Robustness: sample period 1992-2003***(dependent variable: output growth volatility)*

	(1)	(2)	(3)	(4)
	Gross capital flows/GDP	Foreign liabilities/GDP	Gross capital flows/GDP	Foreign liabilities/GDP
Remittances and compensation/GDP	-0.106 [0.058]*	-0.103 [0.059]*		
Workers' remittances/GDP			-0.174 [0.082]**	-0.216 [0.085]**
log inflation	0.708 [0.379]*	0.718 [0.431]	0.115 [0.513]	-0.275 [0.546]
Vol. of changes of M2/GDP	0.974 [0.272]***	0.636 [0.352]*	1.238 [0.301]***	1.261 [0.381]***
credit to the private sector/GDP	-0.176 [0.068]**	-0.114 [0.062]*	-0.204 [0.067]***	-0.195 [0.070]***
(credit to the private sector/GDP) ²	0.001 [0.001]**	0.001 [0.000]	0.001 [0.001]**	0.001 [0.001]*
agricultural share of GDP	0.127 [0.076]	0.070 [0.069]	0.091 [0.093]	-0.000 [0.074]
trade openness	0.046 [0.019]**	0.052 [0.021]**	0.022 [0.023]	0.030 [0.024]
volatility of changes in terms of trade (only goods)	-1.556 [19.631]	3.089 [17.705]	-33.663 [25.638]	-16.800 [22.139]
trade openness* volatility of changes in terms of trade (only goods)	-0.034 [0.237]	-0.148 [0.223]	0.349 [0.297]	0.127 [0.311]
financial openness	-0.014 [0.057]	0.001 [0.007]	-0.058 [0.057]	-0.006 [0.007]
log of beginning of period per capita GDP	1.302 [0.813]	0.512 [0.818]	1.105 [0.959]	0.193 [0.905]
Constant	-11.912 [6.216]*	-5.568 [6.896]	-5.508 [8.070]	3.417 [7.791]
Observations	60	60	50	44
R-squared	0.59	0.39	0.64	0.52

Notes: OLS estimates; robust standard errors in brackets. All the variables are described in Table A1. significant at 10%; ** significant at 5%; *** significant at 1%

Table 7

Robustness: other controls

(dependent variable: output growth volatility)

	[1]	[2]	[3]	[4]	[5]
	Civil wars	Quality of institutions	Government consumption/GDP	Overvaluation index	Current account reversals
remittances and compensation/GDP	-0.314 [0.079]***	-0.274 [0.092]***	-0.305 [0.086]***	-0.344 [0.095]***	-0.307 [0.086]***
log inflation	-0.351 [0.171]**	-0.279 [0.164]*	-0.360 [0.170]**	-0.390 [0.255]	-0.361 [0.179]*
volatility of changes of M2/GDP	0.465 [0.172]**	0.456 [0.156]***	0.454 [0.176]**	0.515 [0.207]**	0.497 [0.171]***
credit to the private sector/GDP	-0.163 [0.039]***	-0.142 [0.044]***	-0.177 [0.044]***	-0.198 [0.052]***	-0.174 [0.045]***
(credit to the private sector/GDP)^2	0.001 [0.000]***	0.001 [0.000]**	0.001 [0.000]***	0.002 [0.001]**	0.001 [0.000]***
agricultural share of GDP	-0.030 [0.026]	-0.019 [0.027]	-0.034 [0.027]	-0.045 [0.033]	-0.035 [0.031]
trade openness	0.061 [0.021]***	0.048 [0.021]**	0.062 [0.022]***	0.067 [0.024]***	0.061 [0.023]**
volatility of changes in terms of trade (only goods)	20.813 [10.566]*	13.090 [9.055]	23.442 [11.272]**	23.341 [10.859]**	21.770 [11.991]*
trade openness* volatility of changes in terms of trade (only goods)	-0.430 [0.145]***	-0.310 [0.122]**	-0.488 [0.164]***	-0.498 [0.155]***	-0.438 [0.159]***
financial openness (foreign liabilities/GDP)	0.005 [0.003]	0.005 [0.003]	0.006 [0.003]*	0.001 [0.004]	0.005 [0.003]*
log of beginning of period per capita GDP	-0.369 [0.276]	-0.419 [0.276]	-0.363 [0.277]	-0.495 [0.318]	-0.370 [0.276]
Civil wars (dummy)	0.465 [0.488]				
Quality of institutions		0.064 [0.221]			
Frequency of current account reversals					-0.589 [2.756]
Government consumption/GDP			0.047 [0.042]		
Overvaluation index				0.005 [0.004]	
Constant	7.528 [2.252]***	7.717 [2.423]***	7.270 [2.360]***	9.017 [3.145]***	7.837 [2.339]***
Observations	51	48	51	45	51
R-squared	0.59	0.55	0.59	0.61	0.58

Notes: OLS estimates; robust standard errors in brackets. All the variables are described in Table A1.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8**Instrumental variable: first stage***(dependent variable: remittances and compensations/GDP)*

	(a)	(b)
Normalised Latitude (90- latitude in degrees)	-0.073 [0.020]***	0.010 [0.055]
Normalised latitude X destination countries GDP growth rate (1980-2003)		-0.031 [0.016]*
destination countries GDP growth rate (1980-2003)		2.186 [1.307]
Constant	14.032 [6.538]**	
Observations	51	51
R-squared	0.39	0.42
Partial R-squared of excluded instruments	0.2215	0.2554
Test of excluded instruments		
F(1,39)	12.99	
F(3,37)		10.48

Notes: OLS estimates; robust standard errors in brackets. The regressions include also the following dependent variables: log (inflation), volatility of changes in M2/GDP, credit to the private sector (also squared), financial openness (foreign liability/GDP), trade openness, volatility of changes in terms of trade (only goods), the interaction between the latter two terms, agricultural share of GDP, log (beginning of period per capita GDP).

*significant at 10%; ** significant at 5%; *** significant at 1%

Table 9

Output growth volatility and migrants' remittances: instrumental variables

(dependent variable: output growth volatility)

	(a)	(b)
remittances and compensations/GDP	-0.696 [0.164]***	-0.755 [0.164]***
log inflation	-0.445 [0.175]**	-0.458 [0.185]**
volatility of changes of M2/GDP ratio	0.517 [0.145]***	0.520 [0.149]***
credit to the private sector/GDP	-0.168 [0.063]***	-0.167 [0.068]**
(credit to the private sector/GDP) ²	0.001 [0.001]	0.001 [0.001]
agricultural share of GDP	-0.054 [0.030]*	-0.057 [0.031]*
trade openness	0.079 [0.022]***	0.082 [0.023]***
volatility of changes in terms of trade (only goods)	23.705 [9.341]**	24.060 [9.558]**
trade openness* volatility of changes in terms of trade (only goods)	-0.581 [0.145]***	-0.603 [0.153]***
financial openness (foreign liabilities/GDP)	0.006 [0.004]	0.006 [0.004]
log of beginning of period per capita GDP	-0.615 [0.382]	-0.655 [0.407]
Constant	11.047 [3.377]***	11.557 [3.571]***
Observations	51	51
Centred R-square	0.36	0.29
Hansen J statistics (overidentification test of all instruments): p-value		0.44

Notes: All the variables are described in Table A1.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A1**List of variables and data sources**

Variable	Data source
Workers remittances and compensation of employees, credit	World Bank, World Development Indicators (2005)
Workers remittances, credit	World Bank, World Development Indicators (2005)
GDP, US dollars	World Bank, World Development Indicators (2005)
GDP per capita, constant 2000 US dollar	World Bank, World Development Indicators (2005)
Trade of goods and services	World Bank, World Development Indicators (2005)
Beginning of period per capita GDP, PPP	World Bank, World Development Indicators (2005)
Terms of trade (only goods) index	IMF, World Economic Outlook database
Agricultural share of GDP	World Bank, World Development Indicators (2005)
M2/GDP ratio	World Bank, World Development Indicators (2005)
Inflation (consumer price, annual change)	World Bank, World Development Indicators (2005)
General Government final consumption expenditure (% of GDP)	World Bank, World Development Indicators (2005)
Credit to the private sector (monetary survey)	IMF, International Financial Statistics (2005 August)
Direct investment in reporting economy	IMF, International Financial Statistics (2005 August)
Direct investment abroad	IMF, International Financial Statistics (2005 August)
Portfolio investment assets	IMF, International Financial Statistics (2005 August)
Portfolio investment liabilities	IMF, International Financial Statistics (2005 August)
Other investment assets	IMF, International Financial Statistics (2005 August)
Other investment liabilities	IMF, International Financial Statistics (2005 August)
Gross capital flows	World Bank, World Development Indicators (2005)
Gross foreign liabilities	Lane and Milesi-Ferretti (2006) database
De jure index of financial openness	Quinn and Toyoda (2008)
Institutional quality	PRS Group's IRIS III dataset
Real overvaluation index	Dollar (1992) and Easterly's on line database
Civil wars dummy	Based on data reported by the Armed Conflict Dataset elaborated by the International Peace Research Institute of Oslo and the University of Uppsala.
Frequency of current account reversal	Based on classification and data reported in Bugamelli and Paternò (2005)
Distribution of migrants by destination countries	Parsons, Skeldon, Wamsley and Winters (2005) database
GDP growth rate	World Bank, World Development Indicators (2007)
Latitude	CEPII

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