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**Remittances Channel and Fiscal Impact in the Middle East,
North Africa, and Central Asia**

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Abstract

This paper identifies a remittances channel that transmits exogenous shocks, such as business cycles in remittance-sending countries, to the public finances of remittance-receiving countries. Using panel data for remittance-receiving countries in the Middle East, North Africa, and Central Asia, three types of results emerge. First, remittances appear to be strongly procyclical vis-à-vis sending country income. Second, remittances tend to be spent on consumption of both imported and domestically produced goods, rather than on investment. Third, shocks in the sending countries are transmitted via remittances to the public finances—specifically, tax revenues—of receiving countries. In the case of the 2009 global downturn, this impact was particularly strong for several countries in the Caucasus and Central Asia, whereas in the subsequent recovery in 2010 virtually all receiving countries benefitted from an upturn in remittance-driven tax revenues.

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I. INTRODUCTION

It is now well recognized that workers' remittances are a sizable and important feature of developing economies throughout the world. The World Bank's *Migration and Remittance Factbook* for 2011 estimates that, after increasing almost without interruption for the past three decades, remittances received by these countries in 2009 amounted to US$416 billion, or 0.7 percent of their aggregate GDP. For 46 of these countries, these flows were in excess of 5 percent of GDP, and for 21 countries they even surpassed 10 percent of GDP. It is common for remittances to be the primary source of external funding in many countries, often dwarfing other flows to the external capital account (Chami et al. 2008, Ratha, 2009). For recipient countries during the 1998–2007 period, on average, remittances were equal to 15 times official transfers, 18 times official capital flows, more than double private capital flows, and about 30 percent of exports (Barajas et al., 2010).

Given the size and persistence of workers' remittances, their possible macroeconomic consequences have been explored in numerous studies, as surveyed in Chami et al., (2008). First, the question of whether they constitute a channel through which long-term economic growth might be enhanced was examined by Chami et al. (2003, 2009b), and Giuliano and Ruiz-Arranz (2009), among others, with mixed results. Second, their impact on short-term volatility was analyzed by Chami et al. (2009a), revealing significant impact of remittances in smoothing macroeconomic fluctuations. Third, the suspicion of possible Dutch Disease effects prompted several studies to measure the impact of remittances on the real exchange rate in recipient countries. Amuedo-Dorantes and Pozo (2004), Holzner (2006), Lartey et al. (2008), Acosta et al. (2009), and Barajas et al. (2010) used multi-country panels and found some evidence of real exchange rate appreciation in response to remittances, although the effect was smaller for more financially developed countries, as well as for countries with more open trade and capital accounts. Fourth, Aggarwal et al. (2010) found a positive association between remittances and the level of banking deposits and credit in the economy, effectively boosting financial development. Finally, Abdih et al. (2009, 2011) showed that the presence of large and stable remittance inflows influences the standard assessment of the adjustment required to achieve fiscal sustainability in receiving countries, and that the fiscal space provided by these flows could also lead to moral hazard behavior on the part of the government.

However, with the notable exception of Abdih et al. (2009) study, very little work has been done on the fiscal implications of remittances in recipient countries. Given the importance of these flows to these economies, two questions arise: To what extent are external shocks—such as those encountered in 2009—transmitted to the domestic economy in remittance-dependent economies through the remittance channel? Second, is the fiscal impact of these shocks significant? This paper explores the impact of remittances on government revenue, not because remittances are taxed directly, but because they could affect private-sector

spending, thereby having an impact on tax revenue. The paper uses a sample of 17 remittance-dependent countries in the Middle East, North Africa, Central Asia, and the Caucasus (MC) for the period 1990–2009. On average, 7 of these received remittances of more than 5 percent of GDP over the period 2007–11 (Figure 1). The ratio of remittances to GDP represents on average 39 percent in Tajikistan, 26 percent in Kyrgyz Republic, and 12 percent in Jordan, and 10 percent in Lebanon.

The paper uses a three-step approach to trace out the channels through which remittances could affect government tax revenues in these countries. First, it examines the determinants of remittances, separating "exogenous" factors related to the economic conditions in sending countries—where these flows would originate—from "endogenous" factors related to economic conditions in the receiving country. Second, it estimates an empirical relationship between remittances and the main components of aggregate private demand: consumption, investment, and imports. Third, it estimates the elasticity of revenue from sales and trade taxes to each of these components, which are used as proxy measures for the respective tax bases.

The empirical analyses yield three important findings. First, consistent with previous studies (Chami et al. (2003, 2005), Lueth and Ruiz-Arranz (2007, 2008), Freund and Spatafora, (2008)), remittances in this sample of MC countries are indeed found to be procyclical with respect to economic conditions in sending countries. A downturn (recovery) in the sending country can be expected to reduce (increase) remittances in the respective receiving countries. Second, remittances appear to significantly affect expenditure on consumption and imports. In contrast, aggregate investment is not significantly affected. This result is consistent with those found in other studies (see Barajas et al. (2010), among others) that failed to detect a robust relationship between remittances and long-term economic growth. Third, elasticities are estimated for sales tax and trade tax revenues with respect to remittance-driven consumption and imports, respectively.

Based on the estimated parameters from this analysis, the period 2009–10 is used as a case study. On the one hand, 2009 is particularly noteworthy in that it constitutes the first-ever recorded worldwide decline in remittance inflows, from US$443 billion to US$416 billion, as estimated by the World Bank. Indeed, as a result of the global financial crisis, sending country income declined notably. As migrants generally work in economic sectors which are particularly vulnerable to business cycle fluctuations (e.g., the construction sector), it is to be expected that their ability to remit back to their home country would be severely affected. The empirical approach described above allows one to trace the impact of the global crisis on fiscal balances in the remittance-recipient countries in the sample, *specifically working through the remittance–tax revenue channel*. Furthermore, based on sending countries' growth rates, the likely impact of the 2010 global recovery on receiving country tax revenue through this channel can also be estimated.

The case study demonstrates that all countries in the sample suffered a significant remittance-driven loss in revenue associated with the downturn in sending countries, with the Central Asia and Caucasus (CCA) countries particularly affected as a result of their high dependence on remittances from Russia. In fact, the paper estimates that between 11 percent and 46 percent of the change in the primary balance in 2009 can be traced to the remittance effect of the slowdown in the Russian economy. Similarly, all countries are estimated to have experienced increased tax revenues in 2010 as a result of the remittance effect of the global recovery. Again, CCA countries were more affected than the others, as a result of the more pronounced turnaround in the Russian economy.

The paper also undertakes a number of robustness checks. First, a gravity model of remittances is estimated using data on bilateral remittance flows, as an alternative approach to confirm whether the result for the procyclicality of remittances with respect to sending country income continues to hold. The paper uses a novel dataset on bilateral remittance inflows compiled for the countries of the MC region for the years 2008 and 2009 (Figure 2 shows the shares of the main remittance-sending regions for each receiving country in the sample). Second, owing to the comparatively poor quality of macroeconomic data in the CCA countries prior to 2000, the regressions are re-run by excluding these potentially troublesome observations. Finally, the three equations areestimated simultaneously, using a three-stage least squares (3SLS) approach, to account for possible error term dependence across equations. All robustness checks confirm the main results of the empirical analysis.

The rest of the paper is organized as follows: Section II describes in detail the empirical approach. Section III discusses the estimation results, then Section IV shows how the set of estimated parameters is used to simulate the fiscal impact during the global crisis of 2009 and the incipient rebound in 2010. Section V provides some robustness checks, and Section VI concludes and provides some policy implications.

II. EMPIRICAL APPROACH

As described above, the paper estimates the remittance channel through which external shocks are transmitted to the domestic fiscal sector, in three steps: First, an equation relating remittances—along with other principal determinants—to foreign income is specified. Second, the elasticity of the private demand components with respect to remittances is estimated. Third, the sensitivity of the tax revenue ratios with respect to their respective tax bases is provided. The section concludes with an alternative estimation, a reduced-form equation linking remittances directly to tax revenue ratios.

The statistics on the structure of the tax revenues in the sample (see Figures 3–5) highlight the relative importance of sales and trade taxes in the total tax revenue. Moreover, the dependency on taxes on goods and services is greater than on trade taxes (they represent on

average 7 percent and 3 percent of GDP, respectively).[2] To the extent that remittance flows affect the tax bases, there should be an expected positive correlation between the tax revenue ratios and the remittance inflows in this region.

A. Remittances and Foreign Shocks

Examining the factors that drive remittances toward developing countries has been one of the most important topics in the recent empirical literature on remittances. The papers that use macro data generally divide the determinants of remittances between sending and receiving country factors. Among the sending country factors, the level of income of these countries is commonly used to proxy for the income earned by the migrants. For example, Chami et. al. (2003), Freund and Spatafora (2008), Adams (2009), and Singh et al. (2009) have found this variable to have a positive and significant impact on remittance inflows in a panel data setting. On receiving country factors however, there is debate on the nature of cyclicality of remittances with respect to receiving country income. Countercyclicality is generally associated with an altruistic motive for remitting, whereas procyclicality tends to be associated with an investment motive.[3]

The literature on the determinants of remittances in the Middle East, North Africa, and Central Asia region has essentially focused on country-specific cases. Bouhga-Hagbe (2004) for example showed how remittances to Morocco are motivated by altruism and appear procyclical to the French GDP per capita. Bouhga-Hagbe (2006) extended the analysis to other countries in the region (Egypt, Jordan, Pakistan, Tunisia, and Morocco) and reached the same conclusion. Shahbaz and Aamir (2009) examined the determinants of remittances in Pakistan, and found a negative and significant relation between remittances and the manufacturing production index in the remittance-recipient countries, which suggests that the altruism motive is at work.

This paper groups together the sample of MC countries in a panel, and is thus the first study to use this approach to identify the main determinants of remittances and trace a remittance channel of transmission of external shocks into the domestic economy.

The specification of the remittance equation follows the standard cross-country approach outlined above. The following explanatory variables are included: the income per capita of the receiving country, the income per capita of the "average sending country"—computed as the sum of the per capita income in each of the other countries in the world weighted by the

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[2] These ratios are computed as simple arithmetic averages for the group of MC remittance-receiving countries over the period 2007–11.

[3] See Chami (2003, 2005), Frankel (2009), Neagu and Schiff (2009), Giuliano and Ruiz-Arranz (2008), Lueth and Ruiz-Arranz (2008), and Sayan (2006) for empirical evidence on this issue.

respective bilateral migration stock shares[4]—the share of outward migrants in the total domestic population, an indicator of financial development, and, finally, the value of the nominal effective exchange rate. Remittances are expected to correlate positively with the stock of migrants abroad, and with the level of financial development.[5] Finally, the level of the exchange rate matters because remitters take into account the value of the domestic currency when they remit. An appreciation of the domestic currency can reduce the remittances ratio because it represents a form of cost for the remitter. However, remittances might increase following an appreciation of the domestic currency when the remitter targets a specific and stable amount of money (expressed in the local currency unit) that his family should receive. Therefore, one might observe that remittances expressed in the sending country currency increase with the appreciation of the receiving country currency. Then, depending on how remittances are measured and on the motivations of the migrants, the effect of the exchange rate appreciation on remittances is a priori unclear.

The empirical specification takes the following form:

$$\log(R_{i,t}) = \alpha + \theta_1 Y_{i,t} + \theta_2 Y^*_{i,t} + \mathbf{X}'_{i,t}\beta + u_i + \eta_t + \varepsilon_{i,t} \qquad [1]$$

where R is either the real value of per capita remittances in U.S. dollars or the remittances scaled by the receiving country GDP. Y and Y^* represent the per capita income in the receiving and the sending country, respectively, expressed in log terms, and $\mathbf{X}$ is a matrix of control variables that includes the other determinants of remittances discussed above. u_i and η_t represent the country and year fixed effects, respectively.

While θ_2 is expected to be positive and significant, the identification of the parameter θ_1 is not straightforward. Indeed, this coefficient is affected by the endogeneity of GDP per capita in the receiving country, to the extent that remittances might affect economic growth in some countries.[6] To deal with this bias, we perform an instrumental variable strategy by instrumenting for the receiving country GDP per capita by the terms of trade and a two-year lag of the private investment ratio in each country.

The analysis covers the period 1990–2009 using annual data. Remittance data are drawn from the IMF Regional Economic Outlook Tables; remittances per capita in current prices are deflated by the consumer price index of each country to obtain series in real terms. All

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[4] Migration shares are used instead of the recent bilateral remittances shares, because the former change slowly over time and our econometric analysis is based on a relatively long period of time. Data on the bilateral migration stocks come from Parsons et al. (2007).

[5] Freund and Spatafora (2008) pointed out the negative correlation between remittance flows and the costs to remit money to the home country. Moreover, they showed that the cost to remit is inversely related to the level of financial development at home.

the remaining control variables are drawn from the recent IMF World Economic Outlook (WEO) Tables except the migration share, which is drawn from the World Bank Tables.[7] All the data are expressed in logarithmic form so that the estimated coefficients directly represent elasticities. Table B2 in Appendix B presents the descriptive statistics of the variables used for the econometric estimations.

The main drawback of this model of remittances is the way the level of income in the sending country is computed. While this approach—of using the migrants' bilateral stock shares—is now common in the literature, the estimation can suffer from an attenuation bias, which arises from the measurement error. The best strategy is to use bilateral data on remittances and to estimate the sensitivity of remittances to the foreign cycle. However, such cross-country panel datasets on bilateral remittances are scarce. Recently, the World Bank estimated bilateral remittances for a large number of countries for the year 2005. The IMF also has compiled bilateral data on net remittance inflows for the years 2008 and 2009. As a robustness check, the paper uses these three datasets to estimate a gravity model of remittances. Different estimators and specifications are used, with details and results presented in Appendix A.

Closer examination of bilateral remittance flows in 2009 (Figure 2) highlights the existence of four main sources of remittances for the MC recipient countries. While the countries of the Mashreq (Egypt, Jordan, Lebanon, Syria) receive a large share of their remittances from the Gulf Cooperation Council (GCC) region. Syria receives remittances from more "diversified" sources. The second most important source for the MC countries, particularly for the CCA countries, is Russia, which contributes on average more than 80 percent of their total remittance inflows. The two remaining important sources are Europe and the United States. While many countries tend to receive a small fraction of their remittances from the United States, dependency on Europe is evident for Morocco and Tunisia (the Maghreb region). The four remittance-source regions, however, differ in terms of their geographical position and cultural links, and are more developed than the remittance-receiving countries.

After presenting the equations linking remittances to foreign income, the next section now turns to analysis of the spending profile of remittances.

B. How Are Remittances Spent?

Remittances are not directly taxed, so their effect on tax revenue would be indirect, through their impact on the private aggregate demand. Specifically, by affecting consumption,

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[6] See Chami (2003), Giuliano and Ruiz-Arranz (2009), Catrinescu et al. (2009), Mundaca (2009), Barajas et al. (2009), and Rao and Hassan (2010) for an estimation of the possible impact of remittances on long-term growth.)

[7] Because the World Bank data on migration are only available for five-year intervals, we perform a linear interpolation of the migration variable to deal with the missing values.

imports, or investment decisions, remittance inflows would affect the size of the tax bases corresponding to different types of taxes. This section quantifies the possible impact of remittances on each demand component, as specified in Equation (2) below.[8]

$$D_{i,t} = \alpha + \theta_1 R_{i,t} + \mathbf{X}'_{i,t}\beta + u_i + \eta_t + \varepsilon_{i,t} \qquad [2]$$

where D represents the logarithm of the GDP share of each alternative private demand component (household consumption, imports, or private investment), R is the log of the ratio of net remittance inflows to GDP, and $\mathbf{X}$ is a matrix of the control variables for each component of private demand, namely the level and variability of income per capita, demographic variables, capital inflows, and the level of financial development.

Thus, the coefficient θ_1 captures the elasticity of the private demand component with respect to remittances, which is expected to have a positive sign. The estimation of θ_1 requires that the results not be affected by the endogeneity bias that may arise from reverse causality.[9] To avoid that bias, the results obtained in Section II are used to instrument remittances by the GDP per capita of the sending country and the two-year lagged value of remittances.[10]

C.   How Do Tax Revenues React to Private Demand Components?

The fiscal impact of remittances depends on the relationship between tax revenues and the components of private demand, which serve as proxies for the respective tax bases. Equation [3] below traces this relationship, which implies that the fiscal impact of remittances will be expressed through the sales and trade tax revenue ratios.

$$T_{i,t} = \alpha + \theta_2 D_{i,t} + \mathbf{X}'_{i,t}\beta + u_i + \eta_t + \varepsilon_{i,t} \qquad [3]$$

T represents each of the relevant tax revenue ratio (in log) subcategory and D the corresponding demand component (tax base) expressed in log. θ_2 represents the elasticity of the tax revenue ratio with respect to each component of the domestic demand, and $\mathbf{X}$ is the

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[8] To our knowledge, this paper is the first cross-country empirical study on the impact of remittances on the components of aggregate private demand using panel data methodology. A previous paper by Kandil and Mirzaie (2009) used a country-case approach for a sample of four receiving countries (Egypt, Jordan, Pakistan, Tunisia) to analyze the macroeconomic effects of remittances (as well as foreign direct investment). They find that remittances have a significant positive impact on private consumption and imports in all four countries, and on investment only in Jordan.

[9] The reverse causality is due to the impact of expected consumption or investment on the demand for remittances in the recipient country.

[10] The two-year lag of the remittance ratio is expected to be orthogonal to the contemporaneous private demand shocks. Moreover, because remittances are characterized by their low volatility, the lagged value of remittances is a good predictor of the actual value.

matrix of basic control variables. Following the recent paper by Mahdavi (2008), controls are included for the level of development, inflation rate, population density, urbanization rate, the agricultural value added, and foreign aid. To deal with the endogeneity bias that might affect the estimation of θ_2, each component of D is instrumented by its lagged value and by at least one of its significant determinants (except for remittances) identified in Equation [2].[11]

D is also instrumented directly by remittances, in order to isolate the transmission channel operating through remittances. In particular, the predicted value of the remittance ratio *solely* explained by the income per capita in the sending country is used as the instrument. The estimated value of θ_2 derived from this latter specification therefore captures the elasticity of the tax revenue ratios with respect to the changes in domestic demand induced by exogenous shocks to remittances.

D. Remittances and the Tax Revenue Ratios: The Reduced-Forms Estimates

As a robustness check, the correlation between remittances and the tax revenue ratios is examined through a direct estimation of the elasticity of either type of tax revenue ratios (sales, trade, and total tax revenues) with respect to remittances. To be consistent with the main topic of the paper, which focuses on the effect of shocks in the sending countries, remittances are also instrumented in each tax equation by the level of income in the sending country. This ensures that the effect of remittances is quantified using the "exogenous" source of variation driven by the income changes in the sending countries.

The reduced-form specification takes the following form[12]:

$$T^j_{i,t} = \alpha + \theta\, R_{i,t} + \mathbf{X}'_{i,t}\beta + u_i + \eta_t + \varepsilon_{i,t} \qquad [4]$$

where T, R, and $\mathbf{X}$ represent tax revenue ratios, net remittances inflows, and the matrix of the control variables, respectively. The superscript j indicates the type of tax revenue (sales, trade, or total tax revenues). All the explanatory variables except the yearly dummies are expressed in log terms, so θ represents the elasticity of the tax revenue ratio with respect to remittances. The model includes the country and time fixed effects, to deal with the various sources of unobserved heterogeneity.

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[11] The endogeneity of the tax bases is a concern here because of the reverse causality: a high level of taxation is expected to decrease the demand and the supply of goods emanating from the private sector.

[12] See Gupta (2007), Mahdavi (2008), and Keen and Lockwood (2010).

III. ECONOMETRIC RESULTS

The analysis is conducted using a panel of remittance-receiving countries over the period 1990–2009.[13] The results are discussed sequentially according to each of the empirical equations described above. The descriptive statistics for the main variables used in the analysis are presented in Appendix B, Table B2.

A. The Elasticity of Remittances to the Sending Country Income

The estimation results are presented in Table 1. First, the results of the Ordinary Least Squares method (with country and time fixed effects) are shown in the first two columns. In column 1, the dependent variable is remittances in U.S. dollars per capita, while in the second column, the remittances share of the GDP is used. Results indicate that the GDP per capita of the receiving country is statistically uncorrelated with remittances, whereas, as expected, the impact of sending country income is positive and highly significant. This elasticity is estimated to be around 2, showing a strong stable relationship across the two specifications.

The robustness of the estimations is checked by controlling for the endogeneity of the GDP per capita in the receiving country. Column 3 presents the results as well as the statistics of the first-stage equation. The strength and the validity of the exclusion restrictions retained are confirmed by the tests, and GDP per capita in each country is strongly associated with the lagged private investment ratio. The last two columns report the second-stage results. Once instrumented, the coefficient of the income per capita in the receiving country is still not significant, while the impact of the sending country income continues to be highly significant, between 3 and 3.2.

The effect of the nominal effective exchange rate is negative and significant in some specifications, which suggests that appreciation of the domestic currency reduces the total level of remittances received by a country.

The results point to a strong and robust impact of economic conditions in the remittance-sending countries in explaining the remittance inflows in the MC countries. Remittances appear highly procyclical vis-à-vis the sending country income. However, the relationship between receiving country income and remittances is not robust. While the common result in the literature is that remittances behave countercyclically with respect to economic conditions at home (see Chami et al. (2003), Barajas et al. (2009), and Frankel (2011)), some papers do find that the countercyclicality of remittances is not always present (see, for

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[13] Except for the gravity model of remittances, which is estimated using data points for 2005, 2008, and 2009.

example, Giuliano and Ruiz-Arranz, (2009), Lueth and Ruiz-Arranz (2008), Sayan (2006), and Neagu and Schiff (2009)).

In Table 2, a gravity model of remittances is estimated using bilateral data. Various specifications and estimators (pooled OLS specifications, fixed-effect variance decomposition estimator, Tobit with endogenous threshold) are retained to identify the effect of economic conditions in the remittance-sending countries. The econometric results confirm the strong and significant impact of the remittance-sending countries' GDP on remittance inflows in the MC region.

B.   Remittances and Private Demand

Results are presented in Table 3. The first three columns are associated with the private consumption equation. Column 1 presents the results of the fixed-effects estimation of the impact of remittances on the share of household consumption in the GDP. Among the control variables included, the share of seniors in the total population, the inflation rate, and GDP growth rate exert a significant positive effect on the consumption ratio. The coefficient of the level of the GDP per capita exhibits a negative and significant sign. This is consistent with the fact that the saving rate increases with the level of development while the share of consumption in aggregate income tends to decrease.

In column 3, the remittance ratio is instrumented by its two-year previous lag and the income per capita of the sending country. The first-stage results are presented in column 2: they confirm both the relevance and the validity of the instruments used. Remittances exert a significant and positive impact on the household consumption ratio, both in the fixed effects and in the fixed effects-IV regressions. Furthermore, instrumenting raises the estimated elasticity from 0.067 to 0.125.

Columns 4–6 repeat the previous exercises for the import ratio equation. The results in column 4 (the fixed-effects estimate) confirm that remittances exert a positive and significant effect on the import ratio, with an estimated elasticity of 0.04. The results also suggest that a positive shock to the government consumption ratio and to the level of development (GDP per capita) increase and decrease the share of imports of foreign goods in the GDP, respectively. When remittances are instrumented for (column 6), the elasticity increases to 0.077 and remains statistically significant. The positive and significant effect of remittances on imports suggests that a non-negligible proportion of remittances is leaked in the form of payments for foreign goods.

The response of the private investment ratio to remittances is presented in columns 7 and 9, with the first-stage results presented in column 8. Irrespective of the specification used, remittances are never significantly related to the share of private investment in the GDP.

The only variables which are significantly associated with the private investment ratio are bank credit to the private sector and the economic growth rate (column 9).

The results imply that remittances are primarily used by the recipients for consumption of domestic and imported production. The conversion of remittances into productive investments has not materialized to a significant degree in this region.

C. Elasticity of Tax Revenue Ratios with Respect to Their "Tax Bases"

The next task is to quantify the elasticity of the sales and trade tax revenue with respect to household consumption and imports, respectively.

Table 4 presents the results of the elasticity of sales tax revenues to private consumption. Column 1 contains the fixed-effects results. The elasticity is positive, significant, and close to 1. In column 2, the endogeneity of the consumption ratio is tackled by instrumenting the variable by its two-year lagged value and one-year lag of the GDP growth rate. This correction leads to an increase in the value of the elasticity to 1.6.

To provide more evidence on the impact of remittances on sales tax revenues through their positive effect on the consumption ratio, private consumption is instrumented by remittances. This significantly affects the estimated elasticity, which now increases to 2.25 (column 3). Private consumption is then instrumented further by the predicted value of remittances *solely* explained by the income per capita in the sending country (column 4). This specification then traces the channel through which a positive or negative shock in the sending country can ultimately lead to a change in sales tax revenues through the sequential effects on remittances and consumption. The elasticity reaches 1.3.

Table 5 presents the results obtained by repeating the same exercise for the import tax revenue ratio. Column 1, obtains an estimated elasticity close to 0.8. However, once the potential endogeneity of the imports ratio is taken into account, the estimated elasticity increases, reaching 1.2 (column 2).[14]

In columns 3 and 4, the import ratio is instrumented directly by remittances and the predicted value of remittances explained by the sending-country income per capita, respectively. The elasticity is notably affected and the size of the coefficient increases significantly.

D. Remittances and Tax Revenue Ratios

Column 6 of Table 4 exhibits the reduced form estimation of the effect of remittances on sales tax revenues; with the first-stage instrumentation equation of remittances shown in

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[14] The instrumentation purges the negative reverse effect of trade taxes on the volume of imports.

column 5. The results confirm that remittances are positively correlated with sales tax revenues, consistent with the fact that remittances were shown to be strongly related to household consumption, which in turn was found to have a significant impact on sales tax revenue. Column 6 of Table 5 presents the results of the reduced-form model of the elasticity of trade tax revenues with respect to remittances. Remittances are instrumented, as was previously done (see column 5), and the effect on the trade tax revenues share is significant, positive, and close to 0.6.

Finally, the estimated relationship between remittances and the total tax revenue ratio is shown in Table 6. As in previous tables, the first column presents OLS-FE results, the second contains the results of the remittances' instrumentation equation, and the third displays the estimated elasticity of the total tax revenues ratio with respect to the remittance ratio. The elasticity is 0.06 and is highly significant. This result indicates that remittances significantly contribute to *fiscal space* in MC receiving countries, and, as already shown, this is primarily due to the impact of remittances on private consumption and imports.

The next section uses the estimated elasticities to analyze the remittance-driven fiscal impact in each remittance-recipient country in the sample, of the 2009 global economic slowdown and of the 2010 recovery.

IV. FOREIGN SHOCKS, THE REMITTANCES CHANNEL AND TAX REVENUES: WHAT HAPPENED IN 2009 AND 2010?

The main estimated equations are used to simulate the effects of the two shock scenarios: a negative shock in the sending countries in 2009 and a positive shock in 2010. The simulation results are discussed below.

A. The Framework

For the year 2009, the fiscal impact of the economic slowdown (the crisis) in the sending regions is evaluated by computing the difference between the predicted tax revenue ratios under the low economic growth observed in many sending countries and the predicted tax revenue ratios under an alternative scenario in which real GDP grows at the same rate as in 2008. The latter is the counterfactual, in other terms, the *status quo* situation.

A similar methodology is applied to the analysis of the recovery of tax revenues due to the economic recovery in the remittance-sending regions in 2010 and 2011. More precisely, the impact of the recovery through the remittances channel is quantified as the difference between the predicted tax revenue ratios induced by global recovery and the predicted tax revenue ratios under an alternative scenario of a continuation of the 2009 real GDP growth rate in the remittance-sending countries.

The fiscal impact of a slowdown or a recovery after a bad shock is given by the following simulation exercise. First, the predicted growth rate of the relevant tax revenue ratio $\widehat{\Phi}_{i,t}$ is defined as a function of $a_{j,t}$, percentage shock a in the real GDP in each sending region j at the year t.

$$\widehat{\Phi}_{i,t} = \sum_{j=1}^{4} \left(r_{i,j} a_{j,t}\right) \times \widehat{\theta}_1 \times \widehat{\theta}_2 \times \widehat{\theta}_3$$

where $\widehat{\theta}_{1,2,3}$ represent, respectively, the elasticity of remittances to the sending-country income, the elasticity of consumption or imports with respect to remittances, and the elasticity of either the sales or trade tax revenues ratio with respect to either the consumption or the imports ratio;[15] $r_{i,j}$ measures the bilateral remittances (share) sent from country j to country i at year t.[16]

To obtain the corresponding prediction of the tax revenues ratio itself, the following calculation is provided:

$$\widehat{ty}_{i,t} = \left(\widehat{\Phi}_{i,t} + 1\right) \times ty_{i,t-1} \quad [5]$$

This predicted value of the tax revenue ratio induced by the foreign shock is then compared to the predicted value of the tax revenue ratio obtained under an alternative scenario dated at the same year t, in which, hypothetically, the growth rates in the sending countries remain the same as in the previous year.

The growth rate of the tax revenue ratio in the "counterfactual" scenario is given by:

$$\widehat{\Phi}^{C}_{i,t} = \sum_{j=1}^{4} \left(r_{i,j} a_{j,t-1}\right) \times \widehat{\theta}_1 \times \widehat{\theta}_2 \times \widehat{\theta}_3$$

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[15] For the purposes of the simulations, the elasticity values used were those obtained after instrumenting the relevant explanatory variable in each model. The elasticity of remittances with respect to foreign income is 3.2 (Table 1, column 5). The elasticity of consumption and imports with respect to remittances are 0.13 (Table 3, column 3) and 0.07 (Table 3, column 6), respectively. The elasticity of sales taxes (trade taxes) with respect to private consumption (imports) is 1.65- Table 4 column 2 (1.20, Table 5 column 2).

[16] The elasticity estimated in the paper can be used to predict only the growth rates of the sales and trade tax revenues ratios, given they are associated with the consumption and imports ratios. Therefore, to compute the predicted growth rate of the total tax revenue ratio, the weighted sum of the growth rates of the trade and sales tax revenues ratios is calculated, with the weights equal to the shares of the sales and trade tax revenues in the total revenues collected by each country in 2009.

The difference with the previous calculation is simply that the values of the real GDP in the sending regions are maintained at their previous values. The level of the tax revenue ratio in the "counterfactual" scenario is given by:

$$\widehat{ty}^{C}{}_{i,t} = \left(\widehat{\Phi}^{C}{}_{i,t} + 1\right) \times ty_{i,t-1} \; [6]$$

Therefore, the fiscal impact of a slowdown or a recovery in the sending countries through the remittances channel is given by:

$$\widehat{ty}_{i,t} - \widehat{ty}^{C}{}_{i,t} = \left(\widehat{\Phi}_{i,t} - \widehat{\Phi}^{C}{}_{i,t}\right) \times ty_{i,t-1} \; [7]$$

This formula is then applied to the scenario in 2009 and to the year 2010 to get the impact of changes in the growth rates in the sending countries in each of these two cases. The following table gives the distribution of the real GDP growth rates in the four main remittance-sending regions in 2009 and 2010.

Remittance sources regions	2008	2009	2010
GCC	7.2	-0.1	5.3
Europe	0.4	-4.1	1.8
United States	0.0	-2.6	2.9
Russian Federation	5.2	-7.8	4.0

Sources: IMF Regional Economic Outlook, Middle East and Central Asia database; and IMF World Economic Outlook database.

B. Discussion of the Results

The fiscal impact in 2009

The results of the simulations for 2009 are presented in Table 7. The results indicate that, on average, the fiscal impact of remittances is more pronounced for the sales tax revenues than for the trade tax revenues. This is not very surprising, given that the remittance-recipient countries in this region rely primarily on sales tax. In the CCA countries, for example, the impact on the sales tax revenues is around –0.7 percent of GDP. The countries most affected by the contraction in the economic activity in the sending regions are Armenia, Georgia, the Kyrgyz Republic, and Tajikistan. This can be explained by two facts. First, Russia was the sending region most affected by the financial crisis in 2009. Second, CCA countries are particularly dependent on remittances from Russia, which increases their vulnerability to shocks to the Russian economy and tends to align their economic activity with the Russian business cycle.

For the Middle East and North Africa, the results indicate that countries such as Jordan, Lebanon, Mauritania, Morocco, and Tunisia are also vulnerable to a slowdown in the economic activity in the sending countries. For Syria and Yemen, on the other hand, the fiscal impact is much lower.

To give an idea of the overall size of the fiscal impact, the percentage change in the primary fiscal balance between 2008 and 2009 due to the slowdown in 2009 is estimated (last column of Table 7). It appears that the change in total tax revenues due to the economic slowdown in 2009 represents a sizable share of the deterioration of the primary fiscal balance between 2008 and 2009. For Tajikistan, for instance, the induced remittance effect of the external shock on total tax revenue represents 56 percent of the change in the primary fiscal balance. Furthermore, the impact represents more than 20 percent of the changes in the primary fiscal balance for Lebanon, the Kyrgyz Republic, and Georgia.

The fiscal impact for 2010

The results of the simulation for 2010 are presented in the Table 8. The recovery in the sending countries seems to be particularly beneficial for the CCA countries, where the total tax revenues increase by more than 0.6 percent of GDP compared to the *status quo* scenario. Except in Yemen, Syria and Sudan, the impact of the global recovery on the total tax revenues represents more than 0.20 percent of GDP.

In summary, the simulations highlight the vulnerability of public finances of the receiving countries to shocks occurring in the sending countries. The CCA countries appear to be the most vulnerable in the region. However, for three countries in the sample, namely Yemen, Syria, and Sudan, the transmission of foreign shocks to public finances via the remittance channel is relatively low.

V. ROBUSTNESS CHECKS

In assessing the results obtained so far, two questions arise. The first is related to the poor quality of the macroeconomic data for the CCA countries prior to 2000, which can bias the results through measurement errors of key variables. Another question is whether the estimation of the various behavioral equations (remittances, private demand profile, and tax collection) should be done simultaneously instead of separately. Robustness checks were conducted to address these two questions, as described below.

A. Excluding CCA Data Before 2000

Due to the sweeping fundamental economic reforms and the transition toward the market-based economic systems that occurred in the CCA countries during the 1990s, the quality of

the macroeconomic data in this region during this period might be called into question. Therefore, the robustness of the previous results is tested by excluding from the sample the troublesome pre-2000 observations for the CCA countries.

Table 9 summarizes the results obtained in this exercise. Column 1 presents the results of the remittances model. The estimated elasticity of remittances with respect to foreign income stands at 2.29, a value relatively close to the corresponding value in Table 1, column 5, which is 3.2.

Columns 2, 3, and 4 of Table 9 present the results of the consumption, imports, and investment equations. The elasticities estimated are 0.2, 0.08, and –0.18, respectively. There are some *small* differences between these results and those obtained in Table 3. Indeed, the new results suggest an elasticity of consumption much greater than in Table 3. For the import ratio, the elasticity (0.08) is very close to the corresponding one in Table 3 (0.07). Finally, for the private investment model, the new estimations suggest a *negative* and significant impact of remittances on the private investment ratio.

Together, these results are qualitatively similar to those obtained previously. Remittances are strongly explained by foreign income; they positively and significantly affect private consumption and imports but not private investment. The same story holds for the sales, trade, and total tax revenue equations. The estimated elasticities appear to be very close to those obtained in Tables 4, 5, and 6.

All these results suggest that the previous estimations were not driven by spurious relationships based on questionable data during the CCA transition period, as the range of estimated elasticities is unaffected by the change in sample.

B. Three-Stage Least Squares Estimates (3SLS)

The second question that can be raised regarding the previous econometric results is that they ignore the fact that the decisions by private agents to spend remittances on consumption, investment, or imports are taken simultaneously. Moreover, the consumption decision is probably made in expectation of a specific amount of remittances. For example, the household can "call" on remittances in order to undertake some consumption or investment plans. Therefore, to the extent that these decisions are linked, it is crucial to control for the correlation between the error terms of all the behavioral equations estimated.

The 3SLS approach is a way to deal with these issues. This method allows for estimating the parameters of a system of equations where the error terms of the different equations are correlated. The advantage of this approach is in estimating a system of equations where

remittances, private demand, and tax revenues are endogenously determined.[17] Moreover, estimating a system of equations allows us to use the same sample across all the equations.

Three systems of equations are estimated by the 3SLS method. System 1 includes an equation of remittances and two equations of the utilization of remittances for consumption and investment. This system represents the simultaneous determination and utilization of remittances in the region. Systems 2 and 3 analyze the relation between remittances and the various types of tax revenue (sales tax revenue and trade tax revenue). System 2 includes an equation giving the amount of remittances explained by foreign income, an equation showing the share of private consumption explained by remittances and, finally, the equation showing the extent to which the sales tax ratio is determined by the private consumption. System 3 analyzes the impact of remittances on trade tax revenues through the imports ratio channel. A remittance determination equation explained by foreign income is specified, the second equation relates the import ratio to remittances, and the third equation specifies the impact of the import ratio on trade tax revenue.

To summarize, System 1 represents the joint determination of remittances receipts and their utilization. Systems 2 and 3 capture the link between exogenous remittances (explained by the foreign income), private demand components (consumption and imports), and government tax revenues (sales and trade tax revenue ratios). A 3SLS estimation with country-specific dummies is used to estimate the parameters. As in the previous estimations, the different equations include their respective control variables. The period of analysis covers 1990 to 2009, except for the CCA countries, for which the sample starts in 2000.

The results of the estimations are presented in Table 10. The first three columns are related to System 1 of the joint determination of remittances, consumption, and investment. The results obtained are quite similar (qualitatively and quantitatively) to those obtained when the equations were estimated separately. Indeed, the elasticity of remittances with respect to the sending country's per capita income is high, positive, and statistically significant. It stands close to 1.7. The second result obtained with the 3SLS is a positive and significant effect of remittances on the private consumption ratio, with an elasticity estimated at close to 0.127, while the corresponding value of this elasticity in Table 3 stood at 0.125. Finally, the last result that emerges from the estimation of System 1 is the insignificant impact of remittances on the private investment ratio, confirming the previous single-equation result reported in Table 3.

System 2 relates remittances to foreign income (column 4), private consumption to remittances (column 5), and the sales tax revenue ratio to private consumption (column 6). Again, the estimated elasticity of remittances with respect to foreign income and the

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[17] This approach has also been used by Gupta et al. (2009) to estimate the effect of remittances on poverty in Sub-Saharan Africa. The system of equations allowed an endogenous determination of remittances and poverty rates.

elasticity of consumption with respect to remittances are quite similar to those obtained in Table 3. The estimated elasticity of sales tax revenue to changes in private consumption is about 0.8, as shown in column 6.

The elasticity of remittances with respect to foreign income and the elasticity of imports with respect to remittances are also close to the values in Table 3. The results also indicate that the elasticity of the trade tax revenue ratio with respect to the imports ratio is 1 and statistically significant.

Together, these results highlight the robustness of the previous results obtained from single-equation or 2SLS estimations using all the available data. Even when the models are specified in the form of systems of equations and estimated using the 3SLS method, the range and the significance of the elasticities obtained remain close to those obtained with the 2SLS.

VI. CONCLUDING REMARKS

This paper identifies a remittance channel that transmits external shocks to the public finances of MC remittance-receiving countries. Remittances influence private demand, which in turn affects government tax revenue. In particular, remittances affect private consumption and imports but not domestic investment. The paper also quantifies the impact of the remittance-channel on the fiscal balances of MC countries from the economic slowdown in 2009 and the recovery in 2010 in the sending countries. The results highlight the acute vulnerability of the Caucasus and the Central Asia region to the business cycle in their main remittance-sending country, Russia. The results also indicate that some countries in the MENA region such as Jordan, Lebanon, Mauritania, Morocco, and Tunisia are vulnerable to business cycle movements in their remittance-sending countries, namely Europe and, to some extent, the United States.

The analysis has a number of important implications. First, remittances can improve fiscal space for countries in this region that are not resource-rich. These inflows not only improve household welfare but also strengthen the fiscal position of the government through the expansion of the tax base.[18] On the other hand, remittances could lead to higher volatility of government revenues of receiving countries, driven by the business cycle in the sending countries. This could have adverse growth implications and provides another potential explanation as to why previous studies have failed to find evidence of growth potential of these flows. Finally, the paper confirms previous evidence that remittances are used primarily for consumption purposes (of both imported and domestically produced goods), and calls into question the developmental implications of these flows.

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[18] However, Chami et al. (2008) and Abdih et al. (2011) show that increased fiscal space could lead to increased moral hazard on the part of the government.

Figure 1. Remittance Net Inflows over the Period 2007–11
(In % GDP)

Sources: Data provided by country authorities; and IMF staff estimates and projections.
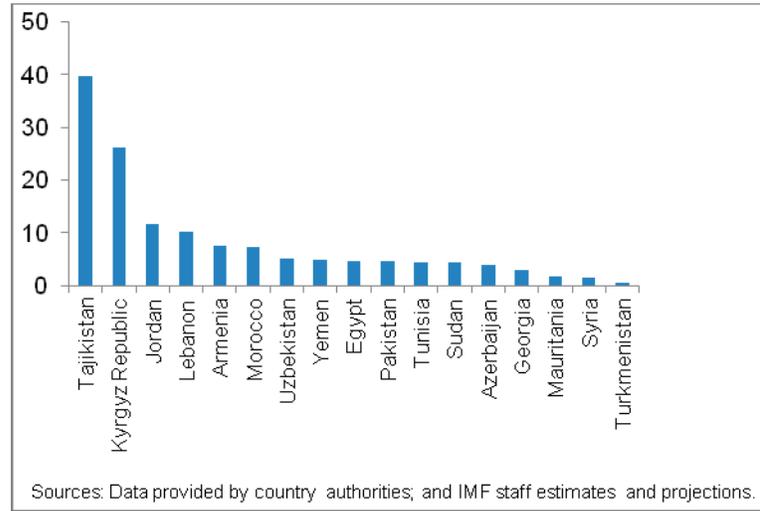
Figure 2. Main Remittance Corridors in 2009

Sources: Country authorities; and IMF staff estimates and projections.
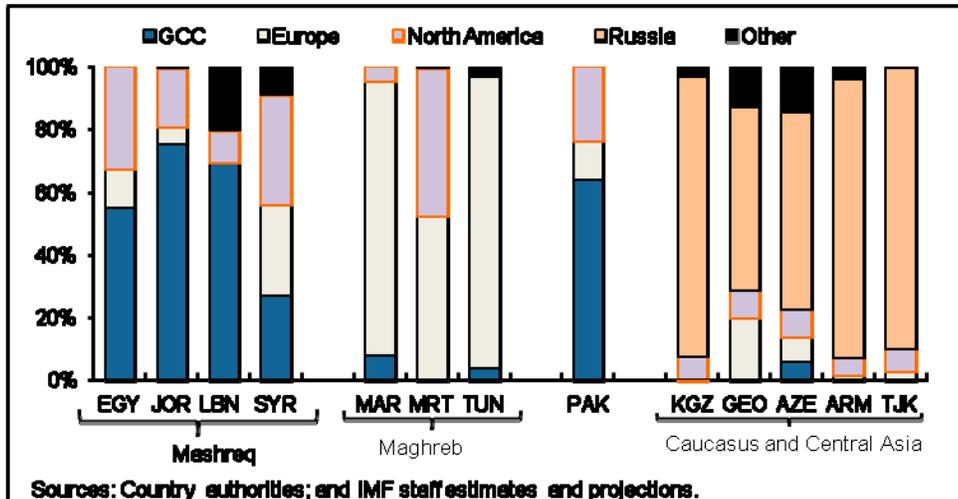
Figure 3. Sales Tax Revenues Ratio, Average 1990–2009

(In % GDP)

Sources: Country authorities; and IMF staff estimates and projections.
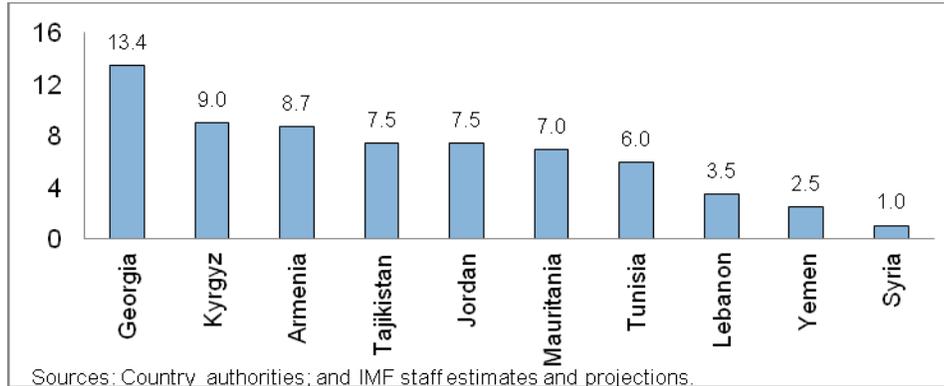
Figure 4. Trade Tax Revenues Ratio, Average 1990–2009

(In % GDP)

Sources: Country authorities; and IMF staff estimates and projections.
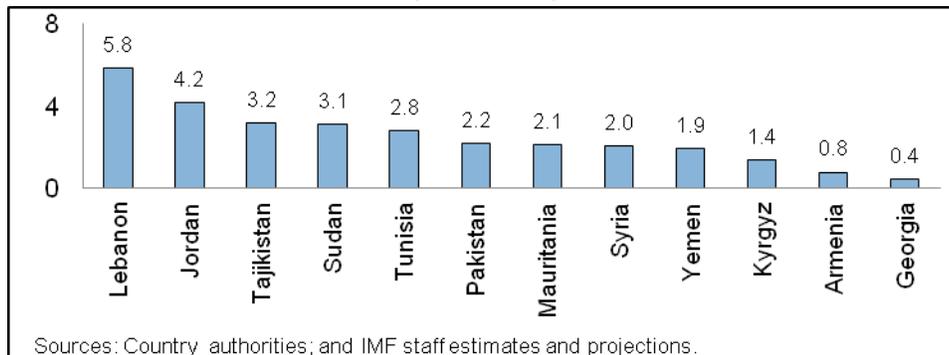
Figure 5. Total Tax Revenues Ratio, Average 1990–2009

(In % GDP)

Sources: Country authorities; and IMF staff estimates and projections.
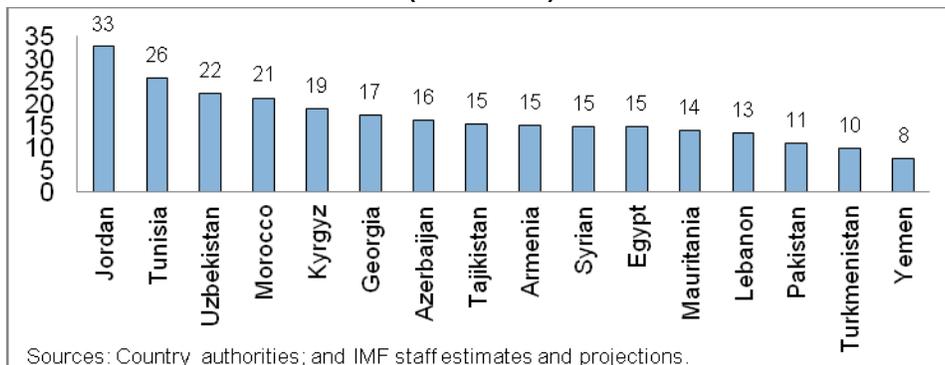
Table 1. Determinants of Total Workers' Remittance Inflows, 1990–2009

	Remittances per capita	Remittances % GDP	Receiving GDP per capita	Remittances per capita	Remittances % GDP
	OLS-FE (1)	OLS-FE (2)	*First stage* (3)	IV-GMM (4)	IV-GMM (5)
GDP per capita in the sending country	**2.530*** **(4.72)**	**2.275*** **(4.25)**	0.442*** (6.55)	**3.016*** **(4.82)**	**3.194*** **(4.66)**
GDP per capita in the receiving country	0.837 (1.46)	-0.137 (0.24)		1.838 (1.41)	-0.543 (0.36)
Financial development (M2/GDP)	0.444 (1.46)	0.432 (1.44)	-0.005 (0.17)	0.340*** (2.92)	0.184 (1.44)
Nominal effective exchange rate	-0.170 (1.21)	-0.439*** (3.20)	0.062*** (3.18)	-0.046 (0.52)	-0.369*** (3.70)
Instruments for receiving country GDP per capita					
2-year lag of private investment ratio			0.052** (2.52)		
Terms of trade index			0.054 (1.36)		
Observations	265	265	212	212	212
Countries	17	17	14	14	14
R^2	0.596	0.393	0.924	0.851	0.674
Shea R^2	.	.	0.051	.	.
Fisher statistic of the instrumentation equation	.	.	5.179	.	.
Hansen p-value	.	.		0.288	0.113
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes	Yes

Note: Robust t-statistics in parentheses. All the variables are expressed in log terms except yearly dummies which are included in all the specifications. GDP per capita in sending countries is the weighted sum of the levels of GDP per capita of each of the sending countries with weights being the bilateral migrants' stock shares drawn from Parsons et al. (2007). Column 3 presents the first- stage equations of the instrumentation of GDP per capita. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2. Gravity Model of Remittances

	(1) Log(R)	(2) Log(1 + R)	(3) Log(R)	(4) Log(1 + R)	(5) [a] Log(1 + R)	(6) Log(R)	(7) Log(1 + R)	(8) [b] Log(a_v + R)
Sending country GDP per capita	**0.474*** **	**1.299*** **	**0.191**	**1.360*** **	**0.595*** **	**0.250***	**1.473*** **	**0.733*** **
	(3.535)	**(7.354)**	**(1.569)**	**(5.923)**	**(6.994)**	**(1.940)**	**(3.689)**	**(7.955)**
Receiving country GDP per capita	0.466**	0.285	0.174	-0.191	-0.632***	0.759***	0.246	-0.00665
	(2.541)	(0.683)	(0.360)	(-0.0929)	(-4.029)	(3.819)	(0.349)	(-0.0577)
Distance	-0.0343	-0.251	-0.0563	-0.255	-0.425***	-1.072***	-3.228***	-0.255**
	(-0.182)	(-0.561)	(-0.508)	(-0.514)	(-2.679)	(-6.114)	(-6.209)	(-2.169)
Common border	0.237	5.013***	0.487	5.414***	3.568***	-0.372	3.126**	1.604***
	(0.490)	(2.713)	(1.323)	(4.301)	(5.771)	(-1.115)	(2.579)	(3.898)
Common language	1.541***	1.569*	0.594***	1.117	1.915***	0.576***	3.028***	0.934***
	(5.792)	(1.930)	(3.206)	(1.240)	(6.622)	(2.958)	(3.846)	(4.570)
Colonial links	1.789***	8.184***	1.910***	7.964***	8.461***	1.234***	8.378***	2.696***
	(3.910)	(3.815)	(6.475)	(3.295)	(13.64)	(3.232)	(2.984)	(6.937)
Constant	8.902***	-8.213	13.40***	-6.032	6.278***	15.23***	5.681	9.749***
	(3.891)	(-1.331)	(3.461)	(-0.365)	(3.023)	(7.614)	(0.749)	(6.040)
Observations	360	1387	360	1387	1387	360	1387	1387
R^2	0.080	0.002	0.638	0.135	0.808	0.895	0.457	.
Countries pairs	166	476	166	476	476	166	476	476
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Random country-pairs effects	Yes	Yes	No	No	No	No	No	No
Receiving country fixed effect	No	No	Yes	Yes	No	No	No	No
Country-pairs fixed effects	No	No	No	No	Yes	No	No	No
Time-varying sending and receiving countries effects	No	No	No	No	No	Yes	Yes	No

Note: Robust t-statistics in parentheses. All the variables are expressed in log terms except dummies variables. 'R' represents the real value of bilateral remittances expressed in U.S. dollars. Bilateral data used in the Table are for the years 2005, 2008, and 2009.

[a] The estimator used in column 5 is the Fixed Effect Vector Decomposition (Plumper and Troeger, 2007). This estimator allows the identification of the coefficients of time-invariant variables (such as geographical and cultural variables) in presence of country fixed effects (here, country-pairs fixed effects).

[b] The estimator used is the version of Tobit estimator proposed by Eaton and Tamura (1994) with the correction made by de Melo and Portugal-Perez (2008). The estimated value of the a_v parameter is about US\$16,700,000.

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

Table 3. Elasticity of Remittances With Respect to the Components of Private Demand

	Private consumption ratio			Imports ratio			Private investment ratio		
	OLS-FE	First-stage	IV	OLS-FE	First-stage	IV	OLS-FE	First-stage	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Remittances ratio	**0.067**[**]		**0.125**[***]	**0.044**[**]		**0.077**[***]	**-0.043**		**-0.097**
	(2.18)		**(3.17)**	**(2.27)**		**(3.02)**	**(0.74)**		**(1.12)**
Control variables									
GDP growth	0.006[*]	-0.010	0.001	0.001	0.015[**]	0.004[**]	0.007	0.011	0.014[**]
	(1.73)	(0.80)	(0.19)	(0.41)	(1.98)	(2.52)	(1.41)	(1.28)	(2.37)
Government consumption ratio	-0.081	-0.508[*]	-0.042	0.209[***]	-0.265	0.182[***]			
	(1.22)	(1.70)	(0.76)	(3.14)	(1.15)	(2.81)			
Population aged >65	0.846[**]	-2.264[*]	1.789[***]						
	(2.06)	(1.76)	(3.27)						
Population aged <14	-0.757	0.984	-1.590						
	(0.72)	(0.35)	(1.52)						
Inflation rate	0.584	-3.314	2.262[**]				-0.802	-1.301	0.006
	(0.79)	(1.43)	(2.39)				(1.04)	(0.87)	(0.01)
GDP per capita	-0.920[***]	0.463	-1.163[***]	-0.760[***]	0.132	-0.987[***]			
	(4.48)	(0.66)	(5.34)	(4.21)	(0.19)	(5.81)			
Foreign aid ratio	0.021	0.135	0.032	0.034	0.153[*]	0.038			
	(0.72)	(1.52)	(1.11)	(1.62)	(1.94)	(1.63)			
Deposits real interest rate	0.566	-5.067[***]	0.640						
	(1.19)	(3.10)	(1.39)						
Real effective exchange rate				-0.224[*]	-0.075	-0.285[***]	-0.064	-0.362	-0.116
				(1.93)	(0.17)	(3.18)	(0.26)	(0.93)	(0.41)
Import deflator to GDP deflator ratio				0.101	-0.629[**]	0.140[*]			
				(1.19)	(2.07)	(1.75)			
Private credit ratio							0.139	-0.011	0.176[*]
							(1.43)	(0.08)	(1.72)
Foreign direct investment ratio							0.050	0.103[*]	0.072
							(1.04)	(2.26)	(1.42)
Instruments for remittances									
Sending country GDP per capita		**1.199**[**]			**1.073**[**]			**1.699**[***]	
		(2.13)			**(2.01)**			**(4.09)**	
2-year lagged value of the remittances ratio		**0.415**[***]			**0.527**[***]			**0.421**[***]	
		(3.54)			**(4.54)**			**(5.19)**	
Observations	169	149	149	217	190	190	174	156	156
Countries	12	12	12	14	14	14	14	14	14
R^2	0.487	0.796	0.478	0.739		0.732	0.293	0.615	0.364
Shea R^2			0.481			0.469			0.520
Remittances Fisher statistic			18.648			17.576			44.190
Hansen p-value			0.137			0.317			0.929

Notes: Robust t-statistic in parentheses. Country fixed effects are included in all the specifications. All the variables are expressed in log term except the yearly dummies which are included in all specifications. [*] $p < 0.1$, [**] $p < 0.05$, [***] $p < 0.01$.

Table 4. Elasticity of the Sales Tax Revenues Ratio with Respect to the Private Consumption and the Remittances Ratios

	OLS-FE (1)	IV [a] (2)	IV [b] (3)	IV [c] (4)	Remittances (5)	IV (6)
Private consumption ratio	0.935***	1.647***	2.249***	1.329***		
	(3.33)	(3.27)	(4.07)	(2.87)		
Remittances ratio						0.203***
						(3.42)
Control variables						
GDP per capita	0.336*	0.087	-0.384	-0.170	-0.726**	-0.516**
	(1.90)	(0.43)	(1.37)	(0.65)	(2.30)	(2.00)
Inflation rate	-0.829	-1.012	-0.946	-0.227	0.211	1.706
	(1.23)	(1.34)	(1.10)	(0.25)	(0.32)	(1.60)
Population density	3.221***	2.942***	4.180***	4.267***	-0.466	5.534***
	(4.88)	(3.94)	(5.11)	(5.75)	(0.72)	(7.52)
Urbanization rate	-1.392	1.847	3.848**	2.166	-0.855	1.777
	(1.00)	(1.08)	(2.14)	(1.33)	(1.11)	(1.36)
Foreign aid	0.190***	0.186**	0.263**	0.212**	0.234***	0.153*
	(2.61)	(2.47)	(2.49)	(2.24)	(3.81)	(1.82)
Agricultural value added	-0.169	-0.143	0.221	0.224	0.046	0.377
	(0.79)	(0.63)	(1.01)	(1.13)	(0.29)	(1.54)
Instruments for remittances						
'Sending country' GDP per capita					1.285***	
					(4.71)	
2-year lagged value of the remittances ratio					0.260***	
					(4.21)	
Observations	178	171	114	114	108	108
Countries	15	15	9	9	9	9
Shea R^2		0.234	0.355	0.344		0.737
Fisher statistic from first-stage regressions		19.215	65.991	42.820		65.413
Hansen p-value		0.284	.	.		0.237

Notes: Robust t-statistics in parentheses. All the variables are expressed in log terms. Due to many missing values in the series of sales taxes, the yearly dummies are not introduced in the specifications.

[a]: The private consumption ratio is instrumented by its 2-year lagged value and the GDP growth rate.

[b]: The private consumption is instrumented by the ratio of remittances.

[c]: The private consumption is instrumented by the predicted value of remittances solely explained by the sending country GDP per capita.

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

Table 5. Elasticity of the Trade Tax Revenues Ratio with Respect to Imports and Remittances Ratios

	OLS-FE (1)	IV [a] (2)	IV [b] (3)	IV [c] (4)	Remittances (5)	IV (6)
Imports ratio	**0.817*****	**1.200*****	**1.481*****	**2.091*****		
	(6.99)	**(3.36)**	**(3.49)**	**(5.08)**		
Remittances ratio						**0.595*****
						(4.57)
Control variables						
GDP per capita	-0.753***	-0.836***	-1.057***	-1.088***	-0.825***	-1.952***
	(3.43)	(3.48)	(3.96)	(3.56)	(2.68)	(5.26)
Inflation rate	0.251	-0.047	-0.414	-1.293	0.660	2.139**
	(0.52)	(0.07)	(0.54)	(1.56)	(0.88)	(2.39)
Population density	-2.949***	-3.193***	-2.818***	-3.358***	0.021	0.014
	(5.27)	(5.11)	(3.74)	(3.90)	(0.03)	(0.02)
Urbanization rate	1.778**	1.759**	-1.808	-3.741*	0.122	4.191***
	(2.47)	(2.08)	(1.01)	(1.75)	(0.14)	(3.30)
Foreign aid	-0.176***	-0.201***	-0.173***	-0.180***	0.239***	-0.160**
	(3.68)	(3.88)	(3.31)	(2.87)	(3.81)	(2.32)
Agricultural value added	-0.461***	-0.400***	-0.604***	-0.818***	0.148	0.147
	(2.86)	(2.55)	(2.63)	(3.37)	(0.89)	(0.54)
Instruments for remittances						
Sending country GDP per capita					**1.206*****	
					(4.25)	
Remittances 2-year lag					**0.292*****	
					(4.83)	
Observations	220	213	128	128	119	119
Countries	18	17	10	10	10	10
Shea R^2		0.133	0.188	0.212		0.677
Fisher statistic from first stage regressions		3.976	16.483	22.659		75.105
Hansen p-value		0.269	.	.		0.619

Notes: Robust t-statistics in parentheses. All the variables are expressed in log terms except the inflation rate and the yearly dummies which are included in all the specifications.

[a]: Imports ratio is instrumented by the size of country (total population), the levels of the real effective exchange rate, and GDP growth rate.

[b]: Imports ratio is instrumented by the ratio of remittances.

[c]: Private consumption is instrumented by the predicted value of remittances solely explained by the sending country GDP per capita.

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

Table 6. Elasticity of the Total Tax Revenues Ratio with Respect to the Remittances Ratio

	OLS-FE results	IV-FE-results	
	Total tax revenues	Remittances	Total tax revenues
	(1)	(2)	(3)
Remittances ratio	0.021		0.059***
	(0.67)		(2.74)
Control variables			
GDP per capita	0.060	-0.922*	-0.304**
	(0.29)	(1.82)	(2.35)
Population aged >64	-1.022	7.592***	-0.979**
	(1.49)	(3.92)	(2.30)
Population density	-0.004	0.006	-1.483***
	(1.04)	(0.69)	(3.28)
Urbanization rate	0.400	-4.878**	1.614**
	(0.54)	(2.12)	(2.48)
Agriculture value added	-0.269	-0.713*	-0.357***
	(1.75)	(1.83)	(3.82)
Inflation rate	1.121**	0.200	1.304***
	(2.97)	(0.14)	(4.42)
Foreign aid ratio	0.010	0.272***	0.004
	(0.30)	(3.29)	(0.14)
Public debt stock ratio	0.109	0.019	0.101**
	(1.46)	(0.17)	(2.43)
Instruments for remittances			
'Sending country' GDP per capita		2.401***	
		(4.94)	
2-year lagged value of remittances		0.178**	
		(2.05)	
Observations	146	135	135
Countries	14	13	13
R^2		0.807	0.502
Shea R^2			0.519
First-stage Fisher statistic			59.128
Hansen p-value		.	0.831

Notes: Robust t-statistic in parentheses. All the variables are expressed in log term except the yearly dummies which are included in all specifications. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7. Fiscal Impact of the Economic Slowdown in 2009

$$\widehat{t}y_{i,t} - \widehat{t}y^{C}_{i,t} = \left(\widehat{\Phi}_{i,t} - \widehat{\Phi}^{C}_{i,t}\right) \times ty_{i,t-1}$$

Country	Real GDP growth in sending regions (%)	Remittances growth rate (%)	Sales tax revenues (% GDP)	Trade tax revenue (% GDP)	Total tax revenues (% GDP)	Change in total tax revenues (% of Primary fiscal balance changes 09/08)
Armenia	-7.14	-22.81	-0.73	-0.03	-0.73	12.95
Azerbaijan	-5.48	-17.49				
Egypt	-1.41	-4.52				
Georgia	-5.59	-17.84	-0.78	-0.01	-0.82	20.29
Jordan [a]	-0.75	-2.38	-0.45	-0.03	-0.50	
Kyrgyz Rep.	-7.17	-22.89	-0.81	-0.08	-0.83	22.50
Lebanon	-0.26	-0.84	-0.22	-0.05	-0.27	20.15
Mauritania [a]	-3.36	-10.74	-0.16	-0.02	-0.18	
Morocco	-3.72	-11.87	-0.36	-0.02	-0.40	9.29
Pakistan [a]	-1.16	-3.70	-0.14	-0.02	-0.16	
Sudan	-0.37	-1.17	-0.10	-0.02	-0.12	3.84
Syria	-1.95	-6.24	-0.05	-0.01	-0.06	4.25
Tajikistan	-7.32	-23.38	-0.94	-0.05	-0.91	55.88
Tunisia	-3.81	-12.18	-0.19	-0.01	-0.20	6.80
Uzbekistan	-3.67	-11.74				
Yemen	-0.34	-1.08	-0.09	-0.01	-0.11	4.31

[a] indicates the countries which have experienced a positive difference between the primary fiscal balances in 2009 and 2008 and then last column numbers are not relevant. Some cells associated with the composition of tax revenues are not filled for some countries due to missing data on tax revenues.

Table 8. Fiscal Impact of the Economic Recovery in 2010

$$\hat{t}y_{i,t} - \hat{t}y^C{}_{i,t} = \left(\hat{\Phi}_{i,t} - \hat{\Phi}^C{}_{i,t}\right) \times ty_{i,t-1}$$

Country	Real GDP growth in sending regions (%)	Remittances growth rate (%)	Sales tax revenues (% GDP)	Trade tax revenue (% GDP)	Total tax revenues (% GDP)
Armenia	3.75	11.98	0.64	0.02	0.66
Azerbaijan	3.22	10.28			
Egypt	4.08	13.03			
Georgia	2.94	9.40	0.78	0.00	0.79
Jordan	4.58	14.62	0.36	0.02	0.38
Kyrgyz	3.79	12.10	0.70	0.06	0.76
Lebanon	3.88	12.38	0.18	0.06	0.23
Mauritania	2.31	7.37	0.25	0.03	0.28
Morocco	2.13	6.79	0.41	0.03	0.43
Pakistan	4.26	13.61	0.13	0.02	0.17
Sudan	2.80	8.93	0.09	0.02	0.10
Syria	2.78	8.88	0.07	0.02	0.09
Tajikistan	3.86	12.33	0.76	0.04	0.80
Tunisia	1.87	5.98	0.23	0.01	0.25
Uzbekistan	1.90	6.08			
Yemen	4.45	14.23	0.09	0.01	0.10

Note: Some cells associated with the composition of tax revenues are not filled for some countries due to missing data on tax revenues.

Table 9. Results of the Estimations Excluding all the CCA Observations Before 2000

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	Remittances [a]	Consumption [b]	Imports [b]	Investment [b]	Sales taxes [c]	Trade taxes [d]	Total taxes [b]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sending country GDP per capita	2.284*** (3.99)						
Remittances ratio		0.221*** (4.16)	0.085* (1.72)	-0.181* (1.92)			0.085*** (3.30)
Consumption ratio					1.413*** (2.96)		
Imports ratio						1.264*** (3.53)	
Observations	202	135	175	150	167	209	128
Countries	14	12	14	14	15	17	13
Centered R^2	0.493	0.529	0.739	0.369	0.366	0.445	0.556
Shea R^2	0.044	0.503	0.444	0.484	0.270	0.142	0.531
Fisher statistic from first-stage regressions	3.698	45.074	79.540	40.221	21.663	4.140	58.870
Hansen p-value	0.043	0.028	0.825	0.089	0.215	0.583	0.144

Notes: Robust t-statistics in parentheses. All the variables are expressed in log terms. All the equations include country, time fixed-effects, and control variables. The matrix of control variables corresponds for each equation to the controls presented in the previous estimations (Table 1 for remittances, Table 3 for the spending components, Tables 4, 5, and 6 for the taxes. The instruments retained for each endogenous variable are the same as those used in the previous corresponding tables.

[a] Instrumented: GDP per capita in the receiving countries. Instruments: Terms of trade and lagged value of private investment ratio.

[b] Instrumented: Remittances ratio. Instruments: Sending country GDP per capita, 2-year lagged value of remittances ratio.

[c] Instrumented: Consumption ratio. Instruments: 2-year lagged value of the consumption ratio and the GDP growth rate

[d] Instrumented: Imports ratio Instruments: Population, REER, and the GDP growth rate.

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

Table 10. Three-Stage Least Squares (3SLS) with Country Dummies: Excluding CCA Observations Before 2000

	System 1			System 2			System 3		
	Remittances (1)	Consumption (2)	Investment (3)	Remittances (4)	Consumption (5)	Sales taxes (6)	Remittances (7)	Imports (8)	Trade taxes (9)
Sending country GDP per capita	1.699*** (4.196)			2.133*** (6.610)			1.739*** (7.646)		
Remittances ratio		0.127*** (3.241)	-0.0651 (-0.843)		0.156*** (8.954)			0.101** (2.319)	
Consumption ratio						0.819** (1.998)			
Imports ratio									0.972*** (5.111)
Observations	105	105	105	81	81	81	122	122	122
R-squared	0.810	0.700	0.655	0.821	0.861	0.898	0.838	0.912	0.800

Note: Robust t-statistics in parentheses. The table presents the results obtained from the estimation of three different systems of equations (Systems 1, 2, and 3) by the three-stage least squares method. All the equations include country fixed-effects and controls variables. The equation for remittances includes the same controls as in Table 1. The consumption and investment equations include the same variables as in Table 3. The sales and trade taxes equations control for the same set of determinants in Table 4 and Table 5, respectively.

APPENDIX. A GRAVITY MODEL OF REMITTANCES

The model

The following gravity model is specified to identify the determinants of bilateral remittances in the Middle East, North Africa, and Central Asia.

$$\ln(R_{ijt}) = \alpha + \theta_1 Y_{it} + \theta_2 Y_{jt} + \mathbf{X}'_{ij}\beta + \varepsilon_{it}$$

where R[19], Y, and $\mathbf{X}$ are the value of real remittances inflows in U.S. dollars, the log of the GDP per capita, and the matrix of geographical and cultural time-invariant variables, respectively.[20] Because the logarithmic transformation of R creates missing values for the zero-remittances observations, we take the usual transformation of data as it is done in the trade literature by scaling the dependent variable as $\ln(1+R)$. We also use the version of the Tobit estimator designed by Eaton and Tamura (1994) and revisited by de Melo and Portugal-Perez (2008). The dependent variable therefore takes the following form: $\ln(a_v + R)$. Under the Eaton and Tamura's (1984) Tobit estimator, instead of arbitrarily imposing $a_v = 1$, the value of the a_v parameter is endogenously determined and the dependent variable will be censored at the value a_v. We expect that $\theta_2 > 0$ and θ_1 will be either positive or negative, depending on the main motive for sending remittances.

We control also for the unobservable heterogeneity by including various types of country and year effects. First we include random country-pair-specific effects in the model. Second, we replace the random country pair effects with the receiving country fixed effects. Third, we use in some specifications the time-varying sending and sending-country-specific effects. Because some of our control variables are time-invariant (geographical and proximity variables), the inclusion of country-pair fixed effects does not allow the identification of the coefficients of these time-invariant variables. However, the recent contribution of Plumper and Troeger (2007) is to design a panel estimator (the fixed-effect vector decomposition estimator) that allows the identification of the coefficients of the time-invariant variables, even in presence of fixed effects.

Data

The bilateral data used in this paper come from two distinct sources. First, we use the World Bank bilateral remittances dataset for the year 2005.[21] Second, for the years 2008 and 2009, we use the bilateral data compiled by the IMF Staff. We use as the 'rest of the world' the top ten remittance-sending countries. (See Table B1 in Appendix B, for the summary statistics).

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[19] We have also replaced the missing country-pairs values with zero in the dataset, so that if a country i doesn't receive remittances from a number of countries j, the bilateral remittances value of this country is zero, instead instead of being treated as a missing value. This correction is important to avoid selection bias in the estimation by only using a sample of country-pairs for which bilateral remittances are strictly positive. However, we will compare the results with and without this transformation.

[20] Remittances in current dollars are converted in real terms by dividing the variable by the receiving country's Consumer Price Index (CPI).

[21] These data are estimated by using the information on income and migrant stocks in each host country. More details on the methodology used for this variable are available at the World Bank website.

Results

The results are presented in Appendix B, Table B2. All the specifications include yearly dummies, except in the ET-Tobit estimation.

The first two columns present the results of the models estimated with country-pair random specific effects. The explanatory variables generally get the expected signs, and some of them are highly significant. For instance, the common language and the colonial links dummies are significantly and positively related to remittances. Moreover, the estimation of the coefficient of the GDP of the sending country appears robust to the choice of the dependent variable. It appears that the elasticity of remittances with respect to the per capita income in the sending country is 0.48 in column 1 and nearly doubled in column 2 (0.958).
In column 3, we replace the random effects with the receiving country dummies, and the dependent variable is the log of the strictly positive values of remittances. Neither the coefficients of the GDP in the receiving and the sending country are statistically significant. In column 4, the dependent variable allows for the presence of zeroes in the remittances series and (only) the significance of the GDP per capita of the sending country is recovered with a value close again to 1.

In column 5, we present the results of the model estimated using Plumper and Troeger's (2007) estimator. The model includes both the country-pairs fixed effects and the time-invariant explanatory variables. The results suggest that sharing a common border and language and having a colonial relationship increase the amount of remittances received, whereas the bilateral distance decreases the amount of remittances. The result that remittances are countercyclical vis-à-vis the receiving country GDP and procyclical with respect to the sending country GDP per capita is also validated.
In columns 6 and 7, the country-pair fixed effects are replaced by the receiving and sending time-varying country-specific effects. When the specification doesn't allow for zeroes in remittances, the elasticity of remittances with respect to per capita income in the sending country is positive, significant, and equal to 0.25 (column 6). In column 7, where the restriction in the dependent variable is discarded, the estimation is more precise and the elasticity is higher (around 1). However, the coefficient of the GDP per capita of the receiving country is no longer significant.

The results obtained with the ET-Tobit estimator (column 8) are also consistent with the previous findings. The bilateral distance is negatively correlated with remittances while the sending country per capita income, the common border, language and colonial tie dummies are positively related to remittances. The elasticity of remittances with respect to the sending country income per capita is around 0.75.

The results of all these specifications suggest that first, geographical and cultural variables matter in explaining remittances to the MC region. This strong explanatory power of the gravity variables has been also shown by Lueth and Ruiz-Arranz (2008). Second, the effect of the income per capita in the sending country is generally significant and positive, and this result appears robust to the various specifications and estimators used.

Table B. Descriptive Statistics of the Variables Used for the Gravity Model

Variables	Obs	Mean	Std. Dev.	Min	Max
Real Remittances, in U.S. dollars	1387	396183.6	1641323	0	2.30e+07
GDP PPP per capita (receiving country), in log	1387	7.59	0.76	5.90	9.07
GDP PPP per capita (sending country), in log	1387	9.51	1.38	5.72	11.45
Distance, in Km	1387	4106.34	3018.03	64.93	17836.17
Common language dummy	1387	0.20	0.40	0	1
Common border dummy	1387	0.045	0.21	0	1
Colonial tie dummy	1387	0.036	0.19	0	1

Table B.2. Descriptive Statistics of the Variables Used in the Remaining Models

Variables	Obs	Mean	Std. Dev.	Min	Max
Remittances % GDP	266	7.06	7.76	0	63.13
Weighted PPP GDP per capita	580	18336.46	11787.52	385.71	46500.00
Household consumption % GDP	519	95.00	239.78	11.64	4526.02
GDP growth (%)	526	21.09	39.35	-53.16	387.12
Government consumption % GDP	520	25.31	41.33	3.65	554.08
Population aged >65 (%)	551	4.09	2.48	1.01	14.56
Population aged <14 (%)	551	35.36	7.74	16.21	51.77
Inflation rate	527	0.16	0.44	-0.13	3.98
PPP GDP per capita	537	9277.34	12886.20	490.01	84350.43
Foreign aid % GNI	426	4.90	7.19	0	45.79
Bank deposit interest rate (%)	344	8.02	6.35	0.80	63.18
Total imports % GDP	525	51.54	32.59	5.60	476.33
Real Effective Exchange Rate	502	97.95	35.02	15.40	601.90
Import deflator over GDP deflator	513	102.04	869.42	0.04	11455.33
Bank private credit % GDP	472	38.09	45.40	1.49	595.67
FDI % GDP	525	3.70	6.83	-39.94	54.47
Total tax revenue % GDP	401	12.82	9.12	0.19	45.20
Sales tax revenue % GDP	241	4.76	5.28	0	27.72
Trade tax revenue % GDP	329	3.48	5.61	0	37.92
Population density	534	91.85	171.46	1.93	1092.37
Urbanization rate (%)	532	60.32	20.80	18.30	98.36
Nominal Effective Exchange Rate	553	332.25	2250.01	0.02	34224.06
Agriculture value added % GDP	445	17.64	13.22	0.26	65.86
Public debt stock % GDP	348	78.97	90.71	0	776.38
Migration stock % Population	284	15.77	12.23	0.65	59.02
Private investment % GDP	236	16.87	6.95	2.96	54.25
Broad money % GDP	284	53.23	54.58	6.64	293.99

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Table B.3. List of Countries: Labor-Exporting Countries of the Middle East and Central Asia

Country	Region	Hydrocarbon Status
Armenia Georgia Kyrgyz Republic Tajikistan	CCA	Importer
Turkmenistan Uzbekistan	CCA	Exporter
Egypt Jordan Lebanon Mauritania Morocco Pakistan Syria Tunisia	MENAP	Importer
Sudan Yemen	MENAP	Exporter

Note: CCA: Caucasus and Central Asia, MENAP: Middle East, North Africa and Pakistan.

Table B.4. Bilateral Remittances over the Total Net Remittances Inflows in 2009.

	Remittance-Sending Countries or Regions			
	GCC	Europe	US	Russia
Armenia	0.00	0.01	0.06	0.89
Azerbaijan	0.06	0.08	0.09	0.63
Egypt	0.55	0.12	0.33	0.00
Georgia	0.00	0.20	0.09	0.58
Jordan	0.75	0.06	0.18	0.00
Kyrgyz Rep.	0.00	0.00	0.07	0.89
Lebanon	0.69	0.00	0.10	0.00
Mauritania	0.00	0.52	0.47	0.00
Morocco	0.08	0.87	0.05	0.00
Pakistan	0.64	0.12	0.24	0.00
Sudan[*]	0.49	0.05	0.04	0.00
Syria	0.27	0.29	0.35	0.00
Tajikistan	0.00	0.02	0.07	0.90
Tunisia	0.04	0.93	0.00	0.00
Uzbekistan[*]	0.00	0.01	0.01	0.46
Yemen[*]	0.81	0.04	0.04	0.00

Note: [*] indicates that for these countries, the World Bank bilateral migration shares in 2005 (See Parsons et al. 2007) have been used instead of the remittances shares in 2009 because of unavailable data.

Source: Country authorities; and IMF staff estimates and projections.

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