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Macroeconomic Determinants of Remittances in Georgia: A Dynamic Panel Data Approach

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Abstract

Using quarterly data on remittances to Georgia by country of origin, the study analyzes key macroeconomic determinants of remittances in Georgia. The empirical results suggest that remittances compensate for relatively unfavorable economic conditions in Georgia – that is, they increase when the growth gap between the remittance-source countries and Georgia widens, emphasizing the compensatory nature of remittances. Remittance flows to Georgia are negatively affected by high unemployment rates in the source countries. The study also reveals that money transfers respond to exchange rate fluctuations. In particular, remitters tend to transfer more money when Lari depreciates, indicating that investment motives may play a role in emigrants' decisions to remit. On the other hand, however, more favorable investment opportunities in Georgia as proxied by an increase in the interest rate differential between Georgia and the remitting countries, do not affect the dynamics of remittances.

Contents

I. Introduction

Remittances represent an important part of international capital flows for developing and emerging market economies. According to the recent estimates by the World Bank remittances to developing countries sent through official channels amounted to $325 billion in 2010.[1] For some countries migrants' money transfers have exceeded the official aid flows and other types of private capital flows, making remittances a significant component of the balance of payments and thus, an important source of financing the current account deficits in developing countries. Obviously, the reported figure underestimates the true remittance flows, as it only reflects the amount of remittances that were transferred through the official channels.

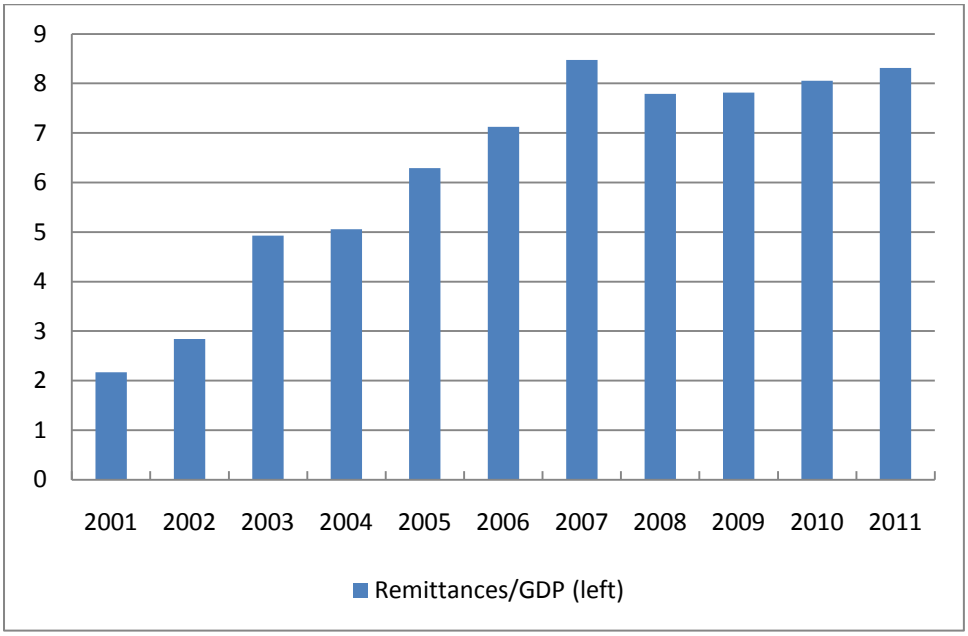
Theoretical literature provides controversial views on the potential long-run impact of remittances on the receiving country's economy. On the one hand, remittances may lead to higher economic growth by mitigating credit and foreign exchange constraints in the recipient country and potentially, by helping recipient households engage in small entrepreneurial activities. On the other hand, if the end use of remittance inflows is consumption (especially, consumption of imported goods), rather than investment in productive assets, then large remittance inflows may even hamper economic growth by resulting in the so-called "Dutch Disease" syndrome.[2] Therefore, the net macroeconomic impact of remittances on receiving countries' economies is ambiguous.[3] The existing empirical literature investigating the economic impact of remittances on a host country's long-term economic growth also reports inconclusive results; while one group of studies finds the impact of remittances on a receiving country's economic growth and employment to be positive (e.g., Catrinescu et al., 2005), the other strand of the literature reports an insignificant or even negative impact of remittances on the home country's long-term economic growth (e.g., Chami, Fullenkamp, and Jahjah 2003; Faini 2006). Nevertheless, a general perception about remittance flows to developing countries is that, by increasing the level of household incomes in recipient countries, they help reduce poverty. Additionally, remittances serve as a major source of

[1] Source: World Bank: "Migration and Remittances Factbook 2011".
[2] "Dutch Disease" refers to the circumstance which leads to large inflows of foreign currency to a country, resulting in an appreciation of the domestic currency and thereby, deteriorating the receiving country's terms-of-trade.
[3] See Docquier and Rapoport (2006) for a thorough theoretical discussion of macroeconomic consequences of remittances.

foreign exchange for many developing countries, in which its limited availability often causes a failure of stabilization policies (IMF, 2005; El-Sakka and McNabb, 1999).

Over the past decade remittances to Georgia have increased sharply with the average annual growth rate of about 34 percent. In 2000 recorded remittances amounted to $63 million (or 2.2 percent of GDP) and, maintaining an increasing path over the subsequent years, peaked at $866 million (8.5 percent of GDP) in 2007[4]. According to the National Bank of Georgia remittances sent through official channels totaled $940 million (8.1 percent of GDP) in 2011 (Figure 1).

Figure 1: Georgia: Remittances/GDP (percent)

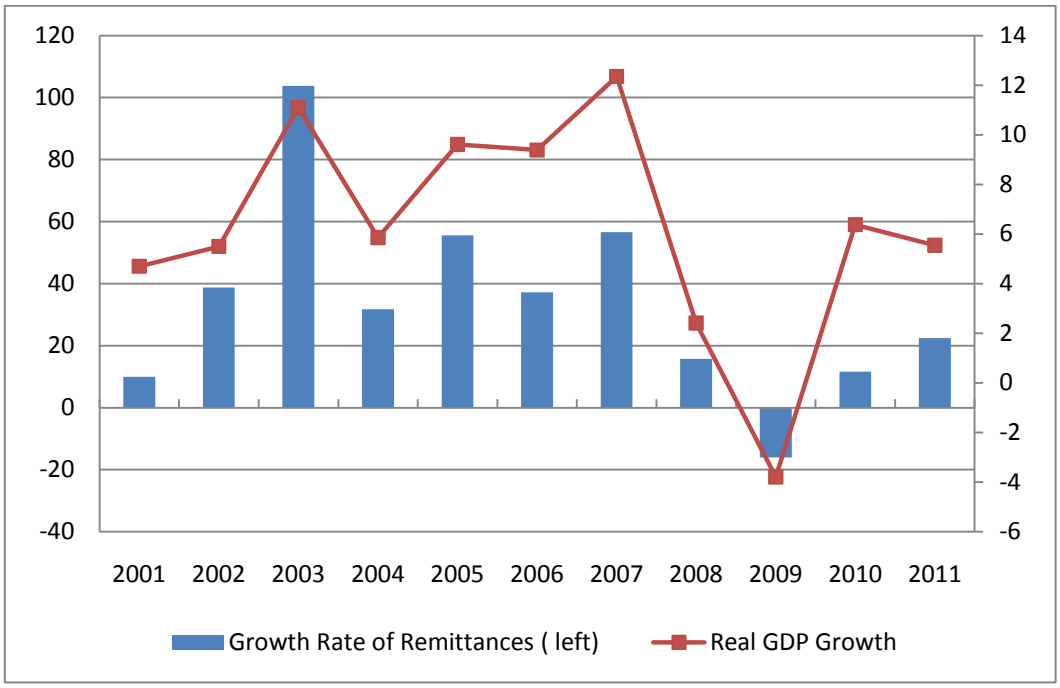


Source: National Bank of Georgia; International Monetary Fund (IMF)

Remittances represent an important source of foreign exchange in Georgia; In 2010 remittances accounted for 18.2 percent of imports, while exports and foreign direct investments (FDI) accounted for 30 and 15 percent, respectively (Figure 3). In addition to this, remittance flows are usually found to be more stable and reliable source of foreign exchange than other types of capital inflows in developing countries (Neyapti 2004). Remittances seem to have the smallest volatility compared to other sources of external financial inflows in Georgia too (see Figure 4).

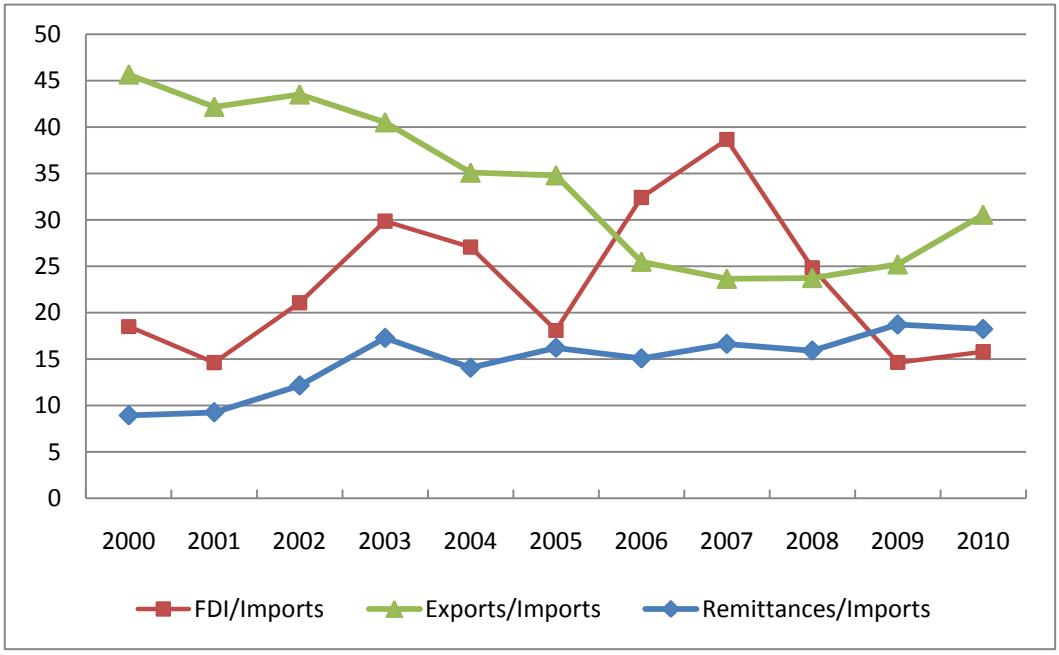
[4] Source: National Bank of Georgia

Figure 2: Georgia: Remittances and GDP Growth



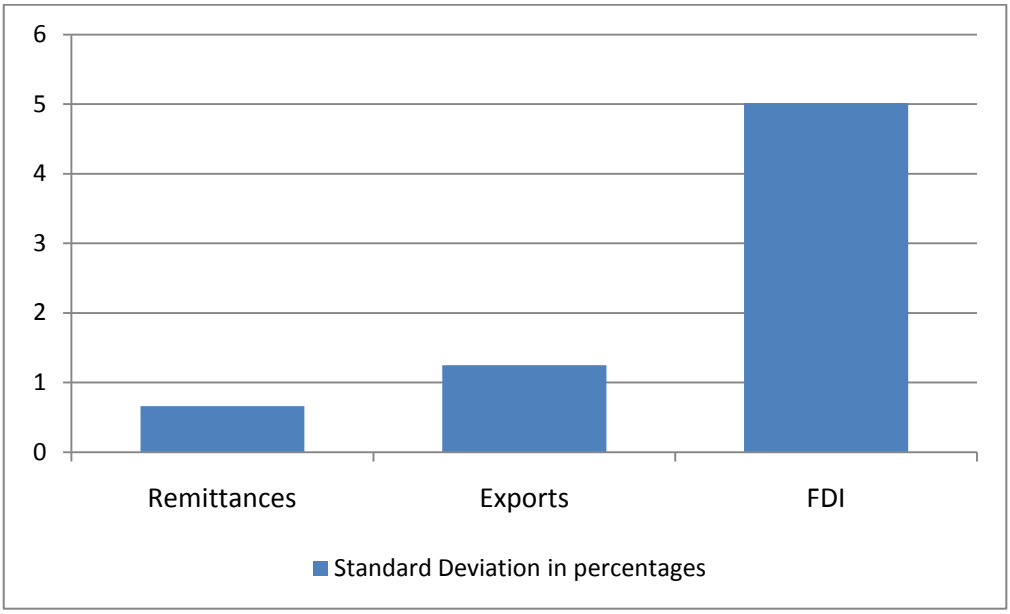
Source: National Bank of Georgia; IMF.

Figure 3: Georgia: Remittances, FDI and Exports (percent of imports)



Source: National Bank of Georgia; IMF.

Figure 4: Volatility of inflows to Georgia



Source: World Development Indicators, National Bank of Georgia and own calculations.
Note: Volatility is measured as a standard deviation of the corresponding inflow to GDP ratio over the period 2000-2010.

In addition to this, analyzing household-survey data from Georgia, Gerber and Torosyan (2010) find that remittances improve recipient households' economic well-being without causing the side effects, such as disincentives for work.

Against this background, it becomes crucial to empirically investigate what factors determine the dynamics of remittance flows to Georgia. Therefore, the main goal of this study – which, to my best knowledge, is the first attempt of this type of empirical analysis conducted in the context of Georgia – is to analyze key macroeconomic variables that might be responsible for the variation in remittance inflows to the country over the period 2000Q1-2011Q3. The study also tries to estimate the impact of the recent global financial crisis and the Russian-Georgian conflict on remittance flows to Georgia. I use the existing data on remittances in Georgia by country of origin in an unbalanced panel data setup to analyze how macroeconomic conditions in sending countries and Georgia affect the amount of official money transfers to Georgia. The analysis shows that higher unemployment rates in the remitting countries reduce the volume of remittances, whereas money transfers increase when the growth gap between the source countries and Georgia widens. The

paper also finds that remittances do not respond to changes in the interest rate differentials between Georgia and the remitting countries. This is in line with the existing evidence from other developing countries. Changes in the nominal exchange rate between Lari and the remitting countries' currencies have been found to have a statistically significant impact on remittances to Georgia.

The remaining part of the thesis is organized as follows: Section II reviews the existing literature on the determinants of remittances; Section III presents data description and methodology; Section IV discusses the main empirical findings; and Section V concludes.

II. Literature Review

The existing literature on the determinants of remittances can be divided into two main categories: The first group of studies focuses on individual characteristics of migrants and their families to explain the dynamics of remittance flows and thus, applies household-level data in the analyses, while the second strand of the existing literature considers the potential effects of key macroeconomic variables on remittances.

A seminal paper by Lucas and Stark (1985) provides three explanations of migrants' decisions to remit. The first explanation is pure altruism: migrants send money to their families in their home country in order to increase their families' income and thus, consumption. In this case remittances should be negatively correlated with family's income in the home country. Second, remittances might be motivated by self-interest, when the migrant aims to inherit part of the family's wealth or take advantage of convenient investment opportunities (i.e. higher returns) in the home country. Finally, remittances could be viewed as an outcome of a "mutually-beneficial contractual agreement" between the migrant and his family members. One of the underlying incentives for such arrangements could be household's intention to diversify risks by locating its members in different countries (cities, regions) which are less likely to be hit by an adverse shock simultaneously (Lucas and Stark 1985). Using the household survey data from Botswana, Lucas and Stark find that both income and education of the migrant have a positive impact on the level of remittances, while migrants who live in host countries with their wives have been found to send

less money to their families. The study also reveals that the number of children in the home country positively affects the amount of money the migrant sends to his family. Similar results have been found by other household-level studies as well. [5]

While the household-level studies consistently estimate the effects of a migrant's individual characteristics on remittances, the results obtained by macro-level literature have been inconclusive. A typical study aiming to estimate the effects of key macroeconomic variables on remittance flows uses either a single equation time series model (if its focus is on one particular country), or a panel data approach (if its focus is on a group of countries). Key macroeconomic variables entered into the model are economic activity in the host and home countries as proxied by real GDP growth rates, stock of migrants in the host country, average wage in the host economy, interest rate differentials and exchange rate between home and host countries and other variables depending on the specific features of the country or the group of countries the study focuses on.

Among the variables listed above, the host country's income, average wage rates and the stock of workers in the host country have been consistently found to have a significantly positive impact on remittances, whereas evidence on the effect of other variables has been rather mixed (see e.g., El-Sakka and McNabb 1999, Aydas et al. 2005, Elbadawi and Rocha 1992, Jan Singh and et al. 2009).

Elbadawi and Rocha (1992) analyze annual data for several North African and European countries. The authors find that the main driving forces of remittances are the level of income in the host country and the number of workers abroad. The study also reveals that currency black market premium and inflation in the home country negatively affect remittances, while interest rate differential has no significant effect on them. Analyzing time series data for Egypt, El-Sakka and McNabb (1999) find somewhat similar results; namely, the authors show that economic activity and the stock of migrants in the host country positively affect the inflow of remittances. However, the authors' findings on the effects of interest rate differentials and inflation in the home country differ from those of Elbadawi and Rocha. El-Sakka and McNabb argue that interest rate differentials negatively affect remittances and inflation has a positive impact on them. The results reported by the two studies, however, can be hardly reliable, as OLS estimations of the time-series

[5] Russell (1986) provides a thorough review of survey-type literature on determinants of remittances.

regression equations in both studies are based on the *levels* of the explanatory variables, which are usually found to be nonstationary.

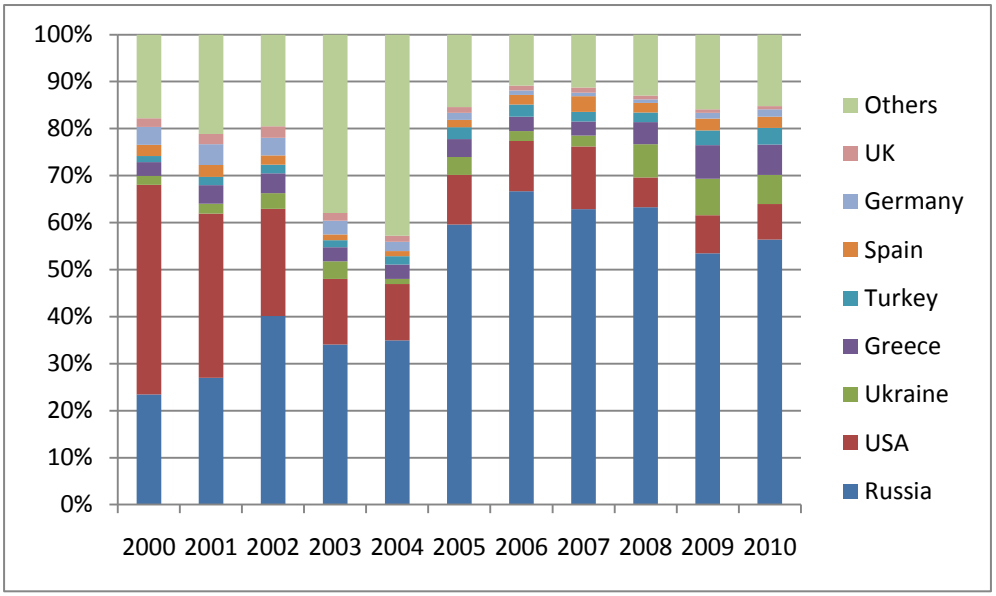
A relatively recent study by Aydas and et al. (2005) applies annual time series data to analyze key macroeconomic determinants of remittance flows to Turkey. The explanatory variables incorporated in the model are very similar to those used by other studies reviewed above. The authors test for stationarity of the variables using the Augmented Dickey-Fuller test and make all the variables stationary by proper differencing. Aydas and et al. find that remittances in Turkey are negatively associated with the home country's income, indicating that Turkish migrants tend to send more money to their families in times of an economic contraction in Turkey. The host country's income has been found to have a significantly positive impact on remittances. In addition to this, the study reveals that remittances are positively related to the differences between domestic and foreign interest rates, indicating that more appealing investment opportunities in the home country attract larger remittance flows. The authors also find a negative impact of domestic inflation on remittances. Their explanation of this result is that although a high inflation rate erodes households' purchasing power and therefore, encourages altruistic emigrants to send more money to their families, it also signals the increased uncertainty in the home country and thereby, discourages those remittance inflows that are guided by investment motives.

Alleyne (2006) employs a dynamic unbalanced panel data model to determine which macroeconomic factors explain the dynamics of remittance flows to nine Caribbean countries that are members of the Caribbean Economic Community and Common Market (CARICOM). Assuming that remittances adjust to some desired level over time the author incorporates lagged remittance flows together with other key macroeconomic variables (these are proxy for host countries' income, real effective exchange rate, GDP of the remittance-receiving country, and interest rate differential) as a regressor in the model. In a dynamic panel data model both fixed and random effect estimators are biased. The author applies the Arellano and Bond (1991) GMM estimator that has been proved to be the most efficient one in a dynamic panel data models (Baltagi, 2005). The study finds the only significant variables are host countries' GDP and interest rate differentials, with positive signs in front of the coefficients.

III. Data Description and Methodology

The empirical exercise conducted in this study uses quarterly data on remittances to Georgia by country of origin for the period 2000Q1-2011Q3. Based on this data I build an unbalanced panel of 14 major source countries for remittances to Georgia: Russia, USA, Ukraine, Greece, Turkey, Spain, Germany, UK, Israel, France, Belgium, Netherlands, Canada, and Poland. For Greece and Ukraine time-period spans 2002Q1-2011Q3, while for the rest of the countries in the sample the time span is 2000Q1-2011Q3.

Figure 5: Remittances to Georgia by Major Remitting Countries



Source: National Bank of Georgia.

The availability of remittances data by country of origin allows me to employ a panel data approach to control for remitting countries' individual heterogeneity. In line with the existing studies on determinants of remittances the following fixed-effects one-way error component specification of the dynamic panel data model has been chosen:

$$\ln(remit)_{i,t} = \alpha \ln(remit)_{i,t-1} + \beta_1(\Delta growth)_{i,t-1} + \beta_2 unemp_{i,t-1} + \beta_3(\Delta intrate)_{i,t-1} + \beta_4 exch_{i,t-1} + \\ + \beta_5 crisis_{i,t} + \beta_6 RusGeo_{i,t} + \beta_7 RoseRev + \beta_8 trend_t + \sum_{j=1}^{3} \delta_j Q_{j,t} + u_i + \varepsilon_{i,t} \quad (1)$$

where $remit_{i,t}$ denotes remittance flows from country i to Georgia in period t; $unemp_{i,t-1}$ is the unemployment rate in a remitting country i at time period $t-1$. I use this variable to proxy the level of migrants' income in host countries. $\Delta growth_{i,t-1}$ stands for the difference between the real GDP growth rates in a remitting country i and Georgia. Thus, it proxies the relative performance of the Georgian economy compared to that of the sending country's economy. If Georgian emigrants compensate for relatively unfavorable economic conditions in Georgia, then we will observe a positive coefficient for this variable. $\Delta intrate_{i,t-1}$ denotes an interest rate differential between Georgia and host country i at time $t-1$. If remittances are driven by investment motives they may positively respond to higher rates of return in the home country. However, as high interest rates may also imply economic instability and thus, higher investment risks in the home country, overall effect of the interest rate differentials on remittances is ambiguous. $exch_{i,t-1}$ is a one-period change in the nominal exchange rate between Lari and the remitting country's currency (an increase in $exch_i$ represents a nominal depreciation of Lari against country *i* 's currency). The inclusion of this variable into the model allows me to test whether Georgian emigrants compensate for changes in the exchange rate.

$crisis_{i,t}$, $RusGeo_{i,t}$, and $RoseRev_{i,t}$ are dummy variables for the recent global financial crisis, the Russian-Georgian conflict and the Rose Revolution in Georgia, respectively. $crisis_{i,t}$ is equal to 1 after 2009:Q1 and 0 otherwise for all the countries in the sample. $RusGeo$ takes value 1 for Russia after the period 2006Q3, when Russian-Georgian diplomatic relationships further deteriorated, and 0 otherwise. In September 2006 Russia suspended issuing visas for Georgian citizens, followed by the deportation of 3000 Georgian emigrants from the country in 2007. Obviously, these events could have redirected Georgian emigrant flows to other destinations and thereby, affecting remittance flows from Russia. On the other hand, however, this dummy may also capture the fact, that after Russia cut off land, railway and air connections with Georgia since October 2006, official means of money transfers (such as bank accounts and other electronic means) became the only means of transferring money from Russia to Georgia. Therefore, Georgian emigrants, who used to send money through unofficial channels before the isolation of Georgia from Russia, may have mandatorily redirected their money transfers towards official channels since October 2006.

However, the latter effect does not seem to be significant in magnitude, as the discrepancy between the true remittances and registered money transfers to Georgia has decreased significantly since 2003 as a result of an increased reliance of the population on the official means of money transfers (NBG, 2009). $RoseRev_{i,t}$ takes the value of 1 after 2003:Q3, and 0 otherwise. It captures the developments in the financial service sector, as well as significant improvements in business environment in Georgia, which might encourage remittance inflows to the country. I also include the time trend variable and quarterly dummies $Q_{j,t}$, $j = 1,2,3,$ to account for a time trend and seasonal patterns that remittances exhibit.

I assume a one-way error-component specification of the model, so that the error term consists of two parts: u_i and $\varepsilon_{i,t}$. The latter denotes an idiosyncratic error term. u_i combines time-invariant unobserved individual characteristics, which I model as the remitting countries fixed effects. The main justification for choosing the Fixed Effects (FE) formulation is that, in macroeconomic panel data models it is very common that unobserved individual characteristics are correlated with the explanatory variables. While FE formulation admits this fact, Random Effects (RE) formulation assumes that the regressors in the model are uncorrelated with unobserved country-specific individual characteristics. Thus, FE formulation of the model has been optimally chosen to avoid the problem of omitted variable bias.[6]

The inclusion of the lagged dependent variable in the regression equation (1) is justified by two reasons. First, by including the lagged value of remittances as a regressor we control for all the unobserved factors which affect remittances and which, at the same time, are potentially correlated with other macroeconomic explanatory variables in the equation. Thus, the inclusion of the lagged dependent variable in the regression equation allows avoiding the problem of omitted variable bias. Second, the existing literature on remittances argues that remittances are persistent as they tend to adjust to a certain long-run desired level. Hence, the inclusion of dependent variable captures this effect. However, having a lagged dependent variable among regressors makes estimation of the panel data model rather complicated. For further analysis it is convenient to rewrite (1) in a general form:

[6] I apply Hausman's specification test to justify the choice of FE formulation. The test results suggest that, indeed, unobserved country-specific characteristics are correlated with the macroeconomic explanatory variables in the model.

$$y_{i,t} = \alpha y_{i,t-1} + \mathbf{x}'_{i,t}\boldsymbol{\beta} + u_i + \varepsilon_{i,t} \qquad (2)$$

where $y_{i,t}$ is a dependent variable, $\mathbf{x}_{i,t}$ represents a $K \times 1$ vector of explanatory variables. $\boldsymbol{\beta}$ is a $K \times 1$ vector of the corresponding coefficients. Without the loss of generality let us assume that the panel is balanced. The problem, which the inclusion of the lagged dependent variable gives rise to, is that under the dynamic specification of the model, conventional estimation techniques, such as Least Squares Dummy Variable (LSDV) or Feasible Generalized Least Squares (FGLS) are no longer applicable. In the case of LSDV estimator Within transformation eliminates the individual heterogeneity u_i, however $y_{i,t-1} - \bar{y}_{i.-1}$, where $\bar{y}_{i.-1} = \sum_{t=2}^{T} y_{i,t-1}/T - 1$, is still correlated with a transformed idiosyncratic disturbance term $\varepsilon_{i,t} - \bar{\varepsilon}_{i.}$, where $\bar{\varepsilon}_{i.} = \sum_{t=1}^{T} \varepsilon_{i,t}$, even if the errors themselves are serially uncorrelated. Hence, LSDV estimator of the dynamic panel data model is biased. Nickell (1981) shows that this bias tends to zero as $T \to \infty$. The FGLS estimator also generates biased results, as quasi-demeaned dependent variable $y_{i,t-1} - \theta\bar{y}_{i.-1}$ is correlated with the transformed error term $\varepsilon_{i,t} - \theta\bar{\varepsilon}_{i.}$ (Baltagi, 2005)

Anderson and Hsiao (1981) propose to apply an Instrumental Variables (IV) procedure to the first-differenced version of (2) to get consistent estimates of α and $\boldsymbol{\beta}$. The logic behind this estimation strategy is quite straightforward. First-differencing of the regression equation (2) removes individual-specific fixed effects u_i. However, the problem of endogeneity still persists, as now the first difference of the lagged dependent variable is correlated with the transformed disturbance term through the lagged idiosyncratic error. The first difference transformation of (2) results in:

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + (\mathbf{x}_{i,t} - \mathbf{x}_{i,t-1})'\boldsymbol{\beta} + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad (3)$$

$$\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \Delta \mathbf{x}'_{i,t}\boldsymbol{\beta} + \Delta \varepsilon_{i,t}$$

Assuming no serial correlation in idiosyncratic errors and $\mathbf{x}_{i,t}$ to be strictly exogeneous, Anderson and Hsiao propose to use $y_{i,t-2}$ as an instrument for $y_{i,t-1} - y_{i,t-2}$. Since $y_{i,t-2}$ is uncorrelated with the transformed idiosyncratic error and highly correlated with $\Delta y_{i,t-1}$, it can fairly serve as a valid instrument for $y_{i,t-1} - y_{i,t-2}$. However, this IV estimator is not efficient as it does not exploit all the

available moment conditions within a given sample. Arellano and Bond (1991) constructed a Generalized Method of Moments (GMM) estimator which utilizes much more information from the sample. To illustrate how this method works let us consider a balanced dynamic panel data model specified in (2) and assume for a moment that idiosyncratic errors are independent of each other within individual panels as well as across cross-sectional units.[7]

Arellano and Bond GMM procedure (AB) uses (3) to obtain consistent and efficient estimates of the population parameters α and $\boldsymbol{\beta}$. Efficiency gains are achieved through the use of all the linear orthogonality restrictions that are available within the sample. To see this, let us rewrite (3) for time period $t = 3$:

$$y_{i,3} - y_{i,2} = \alpha(y_{i,2} - y_{i,1}) + (\mathbf{x}_{i,3} - \mathbf{x}_{i,2})'\boldsymbol{\beta} + (\varepsilon_{i,3} - \varepsilon_{i,2}) \qquad (4)$$

In this case $y_{i,1}$ is a valid instrument for $y_{i,2} - y_{i,1}$ as it is highly correlated with it and uncorrelated with $\varepsilon_{i,3} - \varepsilon_{i,2}$ provided that $\varepsilon_{i,t}$-s are not serially correlated. Likewise, for $t = 4$ we have:

$$y_{i,4} - y_{i,3} = \alpha(y_{i,3} - y_{i,2}) + (\mathbf{x}_{i,4} - \mathbf{x}_{i,3})'\boldsymbol{\beta} + (\varepsilon_{i,4} - \varepsilon_{i,3}) \qquad (5)$$

In this case there are two instruments available for $y_{i,3} - y_{i,2}$. These are $y_{i,1}$ and $y_{i,2}$, both of which are correlated with $y_{i,3} - y_{i,2}$ and uncorrelated with the error term. By the same reasoning, there are three valid instruments available for the first-differenced lagged dependent variable for $t = 5$ and if we continue in this manner the set of available instruments for time period T will be $(y_{i,1}, y_{i,2}, ..., y_{i,T-2})$.

If the explanatory variables are assumed to be strictly exogenous, that is if $E(\mathbf{x}_{i,t}\varepsilon_{i,s}) = 0$ for all $t, s = 1,2,...,T,$ then they can serve as additional instruments for (3) and the matrix of instrumental variables will look as follows:

$$\mathbf{Z}_i = \begin{pmatrix} [y_{i,1}, \mathbf{x}'_{i,1}, ..., \mathbf{x}'_{i,T}] & & 0 \\ & \ddots & \\ 0 & & [y_{i,1}, ..., y_{i,T-2}, \mathbf{x}'_{i,1}, ..., \mathbf{x}'_{i,T}] \end{pmatrix}$$

[7] The discussion which follows, draws on Baltagi (2005) and Arellano and Bond (1991)

In macroeconomic panel data models, however, it is often the case that explanatory variables are predetermined rather than strictly exogenous; that is $E(\mathbf{x}_{i,t}\varepsilon_{i,s})=0$ for $s\geq t$, and $E(\mathbf{x}_{i,t}\varepsilon_{i,s})\neq 0$ for $s<t; s,t=1,...,T.$ In this case only $(\mathbf{x}'_{i,1},...,\mathbf{x}'_{i,t-1})$ are valid instruments at time period t, and the matrix of instrumental variables is as follows:

$$\mathbf{Z}_i=\begin{pmatrix}[y_{i,1},\mathbf{x}'_{i,1},\mathbf{x}'_{i,2}] & & 0\\ & \ddots & \\ 0 & & [y_{i,1},...,y_{i,T-2},\mathbf{x}'_{i,1},...,\mathbf{x}'_{i,T-1}]\end{pmatrix}$$

One can easily adjust the matrix to the cases when strictly exogenous and predetermined variables are both present in a model.

Given the instrumental variable matrix $\mathbf{Z}_i$, theoretical moment conditions have the form:

$$E(\mathbf{Z}'_i\Delta\boldsymbol{\varepsilon}_i)=0, \text{ where } \Delta\boldsymbol{\varepsilon}_i=(\varepsilon_{i,3}-\varepsilon_{i,2},...,\varepsilon_{i,T}-\varepsilon_{i,T-1})' \qquad (6)$$

As the number of instrumental variables far exceeds the number of regressors to be instrumented, GMM procedure can be used to solve for the consistent and efficient estimators of the population parameters in (2).[8]

Consistency of the AB estimator relies on the assumption that idiosyncratic disturbances are serially uncorrelated. This assumption, however, does not necessarily require the independence of the disturbances over time, rather, it may allow for some limited degree of autocorrelation in the idiosyncratic errors. For instance, if the errors within the panels follow $MA(q), q\geq 1$ process, then the AB estimator can be easily adjusted so that the consistency and efficiency of the estimator are still preserved. A crucial condition for the consistency of the AB estimator is the lack of a second-order serial correlation in the first-differenced errors, that is $E(\Delta\varepsilon_{i,t}\Delta\varepsilon_{i,t-2})=0$. If this assumption fails then the orthogonality conditions specified in (6) are no longer applicable. Therefore, one should test whether this condition is actually met within a given sample or not.

[8] See Arellano and Bond (1991) and Baltagi (2005) for a thorough theoretical treatment of AB GMM estimation technique.

Arellano and Bond (1991) develop a direct test for a second-order serial correlation in the first differenced errors and Sargan test of over-identifying restrictions. To test for serial correlation the test statistic is constructed using the residuals obtained from the estimation of the first-differenced regression equation (3) by AB GMM procedure. The null hypothesis of no second-order serial correlation in the first-differenced errors is true whenever the disturbances in levels are uncorrelated or if they follow a random walk process. In the former case, the first-differenced errors will be first-order serially correlated by construction, while in the latter case they will not. Thus, exploiting this fact, one should find an evidence of first-order serial correlation and no evidence of second or higher order serial correlation in the first-differenced errors to verify the consistency of AB GMM estimates. Sargan test of over-identifying restrictions allows to test for the validity of the instrumental variables, or in other words, for the validity of the orthogonality conditions. Under Sargan test, the model is correctly specified if the null hypothesis stating that the moment conditions are valid, is not rejected. Throughout the text I will apply both tests to check for the validity of the obtained results.

IV. Empirical Results

To estimate the dynamic panel data model (1), I apply AB GMM procedure, which is our benchmark estimation technique. The regression results obtained from AB estimation technique are reported in the first column of Table 1. As I have discussed in Section III, the consistency of AB GMM estimator hinges on the fact that there is no second order serial correlation in the first differenced errors. A direct test for the second-order serial correlation in first- differenced errors and Sargan test of over-identifying restrictions are applied to check the validity of the results (as we discussed in the previous section these tests are applicable after the model is estimated by AB GMM technique). The test for serial correlation reveals that there is a first-order, but no second or higher order serial correlation in the first-differenced error, indicating that the model has been correctly identified and, thus, AB GMM estimates are consistent. The test results are reported in Table 2. Sargan test of over-identifying restrictions also reveals that instruments are valid and thus, orthogonality conditions are correctly specified. Table 3 shows that we fail to reject the null

hypothesis of the validity of over-identifying restrictions, indicating the consistency of AB GMM estimates reported in Table 1.

I also carry out robustness checks by estimating equation (1) using different estimation techniques. As we have already noted above, standard estimation techniques of FE panel data models, such as LSDV, give biased estimates if the model contains a lagged dependent variable among regressors. However, the bias tends to zero as the time dimension of a panel approaches infinity. This implies that LSDV can still perform well in panels with a sufficiently large time dimension. Kiviet (1995) derives an analytical expression for the bias in the LSDV estimator and provides a formula for the corrected LSDV (LSDVC in what follows). Judson and Owen (1996) apply simulations to judge the relative performance of OLS, LSDV, LSDVC, and AB GMM for macroeconomic dynamic panel data models in which the time dimension of individual panels is relatively large ($T \geq 10$) compared to typical microeconomic panels. As $T \geq 39$ in our empirical analysis, the results of these simulations are quite relevant to our study. The authors find that in panels with time dimension $T = 30$, the average bias in LSDV estimator of the parameter α becomes smaller; however, one may still expect the bias between 3-30% of the true value of α. The bias of the estimates of $\boldsymbol{\beta}$, however, is negligible when $T = 30$ for all the estimation techniques with the OLS being an exception.[9] The general finding is that LSDVC outperforms the other estimators in relatively small panels both in terms of the average bias and efficiency. However, as T gets large LSDV performs equally well as AB GMM and LSDVC. I exploit these findings to check how robust AB GMM estimates are in our case. In particular, I estimate (1) using LSDV and LSDVC techniques to see whether there are systematic differences in the results obtained from different estimation strategies. I also report the OLS results to evaluate the degree of bias caused by the misspecification of the estimation technique.

Table 1 reports the results from the four estimation techniques. As we can see, AB GMM, LSDV and LSDVC estimates are pretty the same indicating the robustness of our results. The results also confirm the fact that LSDV performs well in panels with long time dimension. As expected, pooled OLS gives biased estimates.

[9] Based on their simulations, Judson and Owen find that OLS is always inferior to the other estimation techniques.

Table 1: Regression Results for the Determinants of Remittances

Dependent Variable: *ln(remit)*				
Variables	**AB GMM**	**LSDV**	**LSDVC**	**OLS**
$ln(remit)_{t-1}$	0.815***	0.805***	0.834***	0.991***
	(32.27)	(35.00)	(28.17)	(126.64)
$\Delta growth_{t-1}$	0.00442*	0.00423*	0.00426*	0.00806***
	(1.77)	(1.83)	(1.72)	(3.73)
$unempl_{t-1}$	-0.0108*	-0.0106*	-0.0104*	-0.00209
	(-1.82)	(-1.93)	(-1.07)	(-0.63)
$\Delta intrate_{t-1}$	0.00246	0.00278	0.00266	-0.00126
	(1.03)	(1.26)	(0.97)	(-1.00)
$exchrate_{t-1}$	0.00581**	0.00576**	0.00577**	0.00623**
	(2.15)	(2.29)	(2.08)	(2.40)
crisis	-0.114**	-0.115**	-0.114**	-0.0797*
	(-2.20)	(-2.40)	(-2.01)	(-1.75)
RusGeo	0.1146	0.1165	0.1092	0.00751
	(0.67)	(0.74)	(0.59)	(0.11)
RoseRev	-0.0458	-0.0477	-0.0461	0.0179
	(-0.94)	(-1.06)	(-1.12)	(0.41)
Number of observations	614	628	628	628

Note: 1) *t* statistics in parentheses
2) * p<0.1, ** p<0.05, *** p<0.01
3) Time trend and quarterly dummies are included, but the estimates are not reported in the table
4) In AB GMM estimation $growth_{t-1}$, $unempl_{t-1}$, $diff_{t-1}$, and $exchrate_{t-1}$ are treated as predetermined.

Table 2: Test for Serial Correlation in First-Differenced Errors

Order	z	p-value
AR(1)	-3.182	0.0015
AR(2)	1.4565	0.1453
AR(3)	0.3705	0.711
AR(4)	-0.77333	0.4393

H0: no serial correlation

Table 3: Sargan Test of Over-identifying Restrictions

$\chi^2(596)$	p-value
513.4646	0.9936

H0: over-identifying restrictions are valid

In the AB GMM estimation I treat the main macroeconomic explanatory variables, $\Delta growth_{i,t-1}, \Delta intrate_{i,t-1}$ and $exchrate_{i,t-1}$, as predetermined (weakly exogenous). Obviously, we cannot assume them to be strictly exogenous, simply because there are feedback effects from remittances to current and future values of those variables. For example, large remittance inflows to Georgia are very likely to put appreciation pressures on Lari or/and boost the economic activity in the country. Weak exogeneity, however, seems to be much more plausible assumption as current shocks to remittances can not affect past realizations of the macroeconomic explanatory variables in the model. Throughout this section, I will refer to AB GMM estimates while interpreting the results.

Our empirical findings are quite consistent with the existing evidence on macroeconomic determinants of remittances. Namely, the results show that remittances in Georgia are indeed persistent, that is current and past values of remittances are strongly correlated. Remittance inflows to Georgia fall with an increase in unemployment rates in the remitting countries: One percentage-point increase in the unemployment rate in the sending countries leads to one percent decrease in remittances in Georgia. Differences in growth rates between Georgia and remitting countries have been found to have a small but still significantly positive impact on the amount of money transfers sent to Georgia, indicating that Georgian emigrants tend to send more money when economic conditions in their home country become less favorable compared to those of

their host countries. One percentage-point increase in the growth gap results in 0.4 percent increase in remittances in the next quarter. Implications of this finding can be important for Georgia, as in times of relatively poor performance of the economy the amount and timing of these inflows can be instrumental in boosting aggregate demand and thus, economic activity in the country. The result also supports the idea that altruistic and compensatory motives play a role in emigrants' decisions to remit.

The interest rate differential does not have a statistically significant impact on the dynamics of remittances in Georgia, potentially confirming the fact that the end use of remittances in Georgia is consumption of household goods, health care expenditures, or investment in different types of assets, rather than direct saving (i.e., depositing money on bank accounts).

Another significant variable is a one-period change in the nominal exchange rate between Lari and the source countries' currencies. One percentage-point depreciation of Lari increases the amount of money transfers to Georgia by about 0.6 percent. The result suggests that the Georgian emigrants' do not compensate for the changes in the exchange rate. Instead, remitters tend to transfer more (less) money as Lari depreciates (appreciates). If investment motives play a role, which seems to be the case here, then this finding suggests that, when Lari depreciates, the remitters take advantage of the favorable investment opportunity and remit more money to buy domestic assets which are now cheaper in terms of foreign currency. Likewise, when Lari appreciates the remitters may postpone their money transfers to the period when Lari is depreciated. This finding has an important policy implication. It points out that remittances serve as a good stabilizer of the exchange rate: In the instances of large depreciation of Lari (which according to our empirical findings stimulate remittances), large remittance inflows may push Lari back to its previous value through the increased demand for the domestic currency.

Not surprisingly, the recent global financial crisis had a significantly negative impact on the amount of money transfers sent to Georgia: Remittances to Georgia reduced by about 11 percent on average due to the global financial crisis. This means, that about two-thirds of a 16 percent fall in the remittance inflows to Georgia in 2009 can be attributed solely to the financial crisis. As regards to the political dummy variables, considerable deterioration in diplomatic relations with Russia had no significant impact on the amount of remittances to Georgia, which is potentially due to the fact

that the stock of Georgian emigrants in Russia is very persistent. The implication of this finding is that the conflict with Russia did not harm the Georgian economy in terms of the amount of remittances received. Thus, despite becoming less popular destination for Georgian emigrants, Russia still remains the major source-country for remittances accounting for 56 percent of total remittance inflows to Georgia.

V. Conclusion

The study applies a dynamic panel data approach to analyze the macroeconomic determinants of remittances in Georgia. It shows that remittances to Georgia are affected by the growth differential between remittance-source countries and Georgia; in particular, remittances increase as the growth gap widens and decrease as the gap shrinks, indicating the compensatory nature of remittances. The study also reveals that remittances decrease with higher unemployment rates in source countries. The increase in the interest differential between Georgia and the major remitting countries, however, do not stimulate remittance inflows to the country.

The study finds that remittances to Georgia respond to exchange rate fluctuations. Namely, remitters respond to depreciation of Lari by sending more money to the country. This behavior suggests that investment motives may dominate, to some extent, the remitters' decisions to remit. The finding may have some important implications for the conduct of monetary policy, as it implies that remittances serve as a good automatic stabilizer of the exchange rate between Lari and foreign currencies. The empirical results also suggest that the shocks to remittances, which had been caused by turbulences in the world economy (i.e., the recent global financial crisis), had a much more severe negative impact than those that were caused by considerable deteriorations in the diplomatic relations with the major remittance-source country, Russia. The study finds that the latter did not have any negative impact on remittance flows to Georgia, while the former did.

Appendix 1: Data Sources and Definition of the Variables

Variable Name	Description	Source
ln(remit)	Remittance flows to Georgia (mln US$), natural log.	National Bank of Georgia (NBG)
Δ**growth**	Difference in real GDP growth rates between a remitting country and Georgia (percent)	International Monetary Fund (IMF): *International Financial Statistics (IFS)*
unempl	Unemployment rate in a remitting country (percent)	International Monetary Fund (IMF): *International Financial Statistics (IFS)*
Δ**intrate**	Difference between deposit rates in Georgia and Treasary bills or deposit rates in a remitting country (percent, period averages)	IMF, *International Financial Statistics*; NBG.
exchrate	One-period percentage change in the bilateral nominal exchange rate between Lari and a remitting country's domestic currency	International Monetary Fund (IMF): *International Financial Statistics (IFS)*
crisis	A dummy variable which equals 1 after 2009:Q1 and 0 otherwise for all the countries in the sample	Constructed
RusGeo	A dummy variable which is equal to 1 after 2006:Q3 if a country is Russia and 0 otherwise	Constructed
RoseRev	A dummy which takes the value of one after 2003:Q3 and 0 otherwise	Constructed

Appendix 2: Summary Statistics by Remitting Countries

Variable	Mean	Std. Dev.	Min	Max	Obs
Belgium					
ln(remit)	-0.72	0.46	-1.45	0.14	47
Δgrowth	1.65	1.82	-4.17	5.05	47
unempl	7.69	0.68	6.30	8.80	47
Δintrate	6.85	2.04	0.79	10.47	47
exchrate	0.41	4.29	-8.70	11.17	47
Canada					
ln(remit)	-0.84	0.76	-2.21	0.46	47
Δgrowth	2.21	1.99	-3.65	5.72	47
unempl	7.12	0.81	5.50	8.67	47
Δintrate	6.62	2.12	0.98	10.88	47
exchrate	0.60	3.94	-8.30	7.47	47
France					
ln(remit)	-0.38	0.83	-2.49	0.92	47
Δgrowth	1.41	1.71	-3.95	4.29	47
unempl	8.52	0.65	7.20	9.50	47
Δintrate	6.77	2.05	0.71	10.38	47
exchrate	0.41	4.29	-8.70	11.17	47
Germany					
ln(remit)	0.37	0.55	-0.74	1.50	47
Δgrowth	1.30	2.63	-6.82	4.94	47
unempl	8.77	1.85	5.90	12.57	47
Δintrate	5.39	1.79	0.37	8.19	47
exchrate	0.41	4.29	-8.70	11.17	47
Greece					
ln(remit)	1.60	1.06	-0.34	3.11	39
Δgrowth	1.30	4.31	-8.60	7.42	39
unempl	10.23	2.35	7.20	17.70	39
Δintrate	6.59	1.56	3.52	9.44	39
exchrate	0.62	3.90	-8.70	7.83	39
Israel					
ln(remit)	0.14	0.69	-0.90	1.32	47
Δgrowth	3.81	3.33	-4.69	11.44	47
unempl	8.40	1.71	5.50	11.60	47
Δintrate	5.09	2.78	-1.14	10.17	47
exchrate	0.08	3.10	-7.24	7.66	47

Appendix 2 continued:

Variable	Mean	Std. Dev.	Min	Max	Obs
Netherlands					
ln(remit)	-1.50	0.46	-2.42	-0.72	47
Δgrowth	1.64	2.12	-4.51	4.73	47
unempl	4.81	1.18	2.43	6.90	47
Δintrate	6.51	1.59	2.22	9.33	47
exchrate	0.41	4.29	-8.70	11.17	47
Poland					
ln(remit)	-2.11	0.88	-3.41	-0.23	47
Δgrowth	3.99	2.06	-0.25	7.55	47
unempl	15.21	3.59	9.07	20.63	47
Δintrate	2.19	4.78	-10.66	7.65	47
exchrate	0.41	4.29	-8.70	11.17	47
Russia					
ln(remit)	3.63	1.39	1.13	5.26	47
Δgrowth	5.39	4.93	-11.15	13.09	47
unempl	7.82	1.41	5.60	12.40	47
Δintrate	4.12	1.88	-0.63	8.03	47
exchrate	-0.48	3.36	-12.99	6.50	47
Spain					
ln(remit)	0.53	1.15	-1.20	2.50	47
Δgrowth	2.26	2.43	-4.51	5.82	47
unempl	12.72	4.32	7.95	21.52	47
Δintrate	6.42	1.81	1.05	10.10	47
exchrate	0.41	4.29	-8.70	11.17	47
Turkey					
ln(remit)	0.58	1.29	-2.02	2.24	47
Δgrowth	4.67	6.11	-14.74	12.22	47
unempl	10.28	2.05	5.60	15.80	47
Δintrate	-21.73	18.83	-76.03	-2.81	47
exchrate	-2.54	8.52	-34.74	18.73	47
United Kingdom					
ln(remit)	0.01	0.68	-1.80	1.01	47
Δgrowth	1.90	2.68	-6.87	5.21	47
unempl	5.80	1.15	4.63	8.09	47
Δintrate	5.69	2.60	0.30	10.56	47
exchrate	-0.30	3.92	-8.45	7.22	47

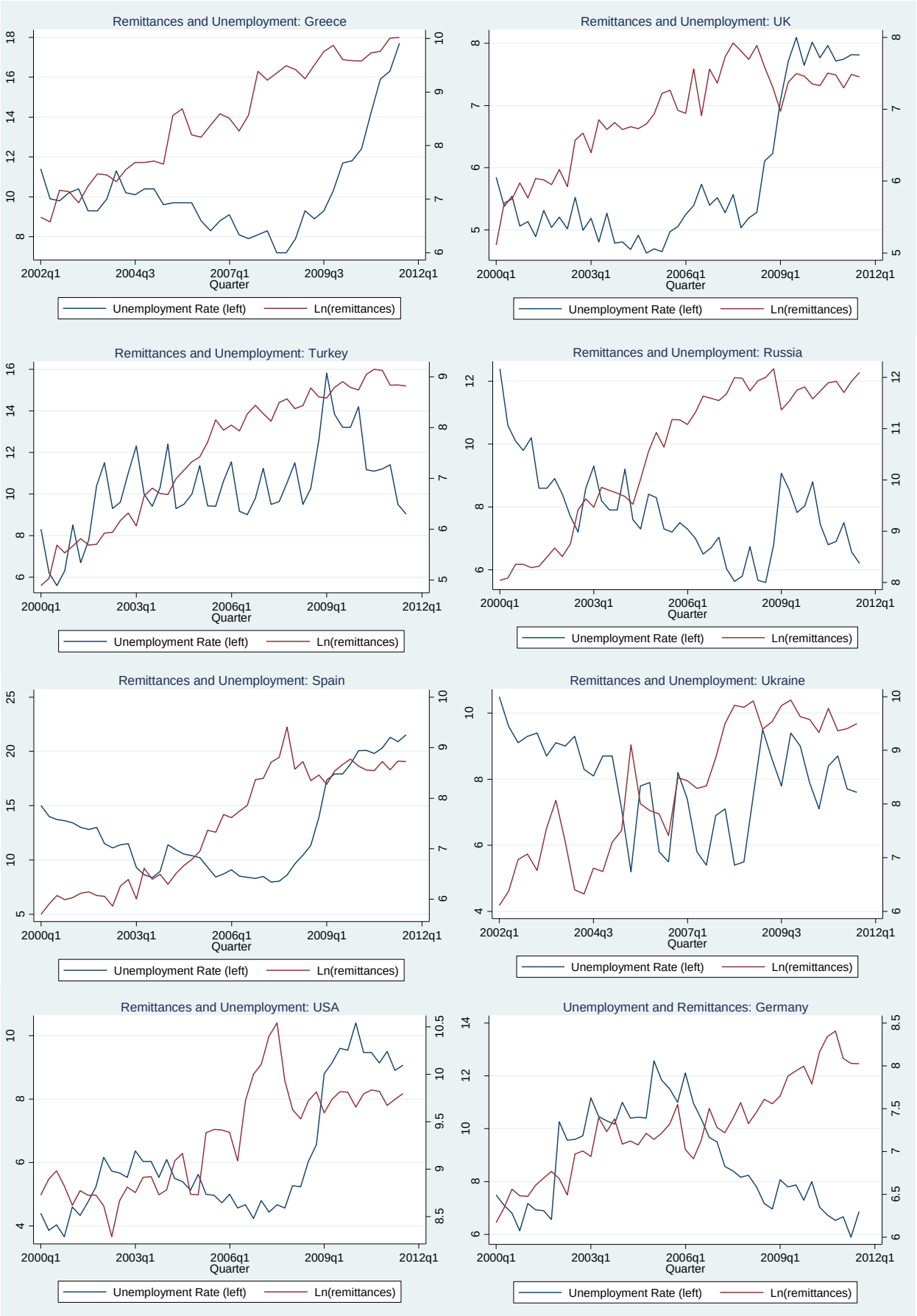
USA					
ln(remit)	2.41	0.55	1.38	3.63	47
Δgrowth	1.81	2.20	-5.03	5.38	47
unempl	6.12	1.93	3.67	10.40	47
Δintrate	7.01	2.36	1.65	11.00	47
exchrate	-0.29	3.14	-7.06	10.21	47
Ukraine					
ln(remit)	1.40	1.24	-0.80	3.03	39
Δgrowth	4.27	7.75	-19.59	14.05	39
unempl	7.90	1.39	5.20	10.50	39
Δintrate	0.56	2.44	-5.60	4.83	39
exchrate	-1.58	3.79	-15.58	5.23	39

Appendix 3: Summary Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
ln(remit)	642	0.34	1.73	-3.41	5.26
Δgrowth	642	-3.45	5.43	-18.6	14.94
unempl	642	8.66	3.37	2.43	21.52
Δintrate	642	3.43	9.17	-76.0	10.99
exchrate	642	-0.09	4.48262	-34.7	18.73

Appendix 4: Remittances and GDP Growth by Selected Remitting Countries

Appendix 5: Remittances and Unemployment by Selected Remitting Countries



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