HOME AND HOST COUNTRY BUSINESS CYCLES AND REMITTANCES: 
THE CASE OF EL SALVADOR AND THE DOMINICAN REPUBLIC 
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Abstract
Remittances have become an effective source of balance of payment sustainability in several small countries in Latin America, and thus a particular concern among developmental economists is the source driving remittances into this region. This paper studies the properties and cyclical nature of remittances in El Salvador and the Dominican Republic, two countries with large per-capita remittance value in Latin America. Impulse-response functions are estimated to assess the effects that domestic GDP and US GDP have on remittances. The results evidence a counter-cyclical relationship between remittances and domestic output, corroborating the altruistic motive to remit. In addition, the US economy plays a key role in determining remittances in these countries, indicating that besides international trade and foreign direct investment, remittances further bind these nations to the US economy.

JEL Classification Numbers: E32, F22, F24, O54.
Keywords: Remittances, business cycle, Vector Autoregression models, impulse response functions, El Salvador, Dominican Republic

1. Introduction
Remittances, or the money sent by immigrant workers back to their home countries, have been rightly labeled “the manna from abroad,” as it is a major source of economic sustainability and poverty alleviation in several developing countries (Adams and Page, 2005; Acosta et al., 2007). At first glance, it seems that these massive proceeds, mainly from the United States, have successfully achieved what foreign investment and foreign aid have failed to accomplish in most countries in Central America and the Caribbean. They have improved the economic welfare of a vast population, enhanced their purchasing power, and reduced the liquidity constraints among entrepreneurial citizens (Amuedo-Dorantes and Pozo, 2006; Woodruff and Zenteno, 2007). At the macroeconomic level, these financial inflows have reduced country risk indictors and government debt burdens (Chami et al., 2005).

Remittances, nonetheless, have altered individual and household behavior in the marketplace and in labor participation (Rodriguez and Tiomson, 2001). For instance, Caceres and Saca (2006) found that remittances stimulate private consumption and imports, thus deteriorating the trade balance in El Salvador. Acosta et al. (2009) found that Salvadoran remittances are associated with lower labor supply and a bias toward the consumption of nontradables. In addition, remittances induce more international migration, particularly among skilled and educated individuals, thus promoting the so-called “brain drain”.

Before delving into their effect on recipient economies, it is important to address the factors driving remittances into a developing nation. The literature identifies three main factors or motives to remit. The altruistic motive states that the consumption and well-

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being of family members left behind are factored into the utility function of the immigrant worker; thus, remittances are sent upon recipient’s requests and needs. The self-interest motive states that the remitter’s objective is to increase assets in his home country as a way of smoothing consumption or insuring against income losses in the case of an eventual return. Finally, the capacity to remit depends on the job opportunities available in the host country and its current demand for foreign labor force. Numerous studies have taken on the challenge of assessing the relevance of each motive to remit in the developing world, but data limitations have posed serious constraints.

The purpose of this study is to focus our attention on El Salvador and the Dominican Republic, two countries in which remittances account for 16 and 6 percent of total GDP respectively. The study contributes to the current literature in several ways. First, it provides key evidence about the cyclical features of remittances in small-low-income economies. Earlier work on remittances in the Central America region has extensively investigated the impact of remittances on poverty, education, inflation and growth, but fewer studies have focused on the determinants of remittances applying business cycle analysis.

Second, the factors driving remittances into the developing world have been studied under mega-dataset analysis, in which several countries are pooled together (Sayan, 2006; Chami et al., 2008). Results from this work are still open to discussion due to the stark differences among countries—not only in terms of remittance donors, but also in terms of levels of economic development. In addition, countries collect and report remittances differently; thus the quality of the data is greatly questionable in studies that compile information on numerous countries. We retrieved the data directly from central banks instead of using the IMF Balance of Payment information or the World Bank Development Indicators.1

Third, we include the coffee price series as a potential explanatory variable. Sosa and Cashin (2009) study the impact that external shocks such as oil prices have on the business cycle of small open economies. Similarly, El Salvador and the Dominica Republic are small open economies whose exporting sector and rural labor force rely on coffee prices.

This paper is arranged as follows. Section 2 briefly describes major historical periods of international migration in El Salvador, a country with approximately two million people or one-third of the population living and working abroad.2 This section also introduces recent trends in remittances and their economic relevance to El Salvador and the Dominican Republic. Section 3 presents a literature review on the topic of remittances and business cycles followed by the methodological approach. We estimate a series of Vector Autoregression (VAR) models and Vector Error Correction Models (VECM) linked to impulse-response functions (IRFs). The results validate the premise that

1 A serious limitation is that data on remittances collected by each country might contain different information. For example, some countries combine all types of wages and income earned by residents paid by non-residents, including workers employed by foreign companies, or income arising from changing residency, which does not describe the kind of remittance discussed in this paper (Chami et al., 2008).

2 The most recent data available on Salvadorian migrants vary enormously, depending on the source and date the information was collected. For instance, the 2000 US Census accounted for 800,000 Salvadorian immigrants, but the Salvadorian authorities estimated 2.5 million for the year 2002 (UNDP, 2005).
remittances are another channel through which the United States affects the economies under study. We also found that remittances are sound and stable foreign capital inflows that are only weakly affected by domestic business cycles. Section 4 summarizes advances in the empirical analysis of remittances in small-low income countries.

2. A Brief Review on International Migration in El Salvador

Overpopulation, famine, limited property rights on productive land, and a lack of job opportunities have characterized El Salvador in the last century. These circumstances have transformed the country into an active labor-exporting economy in which its population has practically split into two groups: those staying behind, and those living and working abroad.

Salvadorian migration has a long history that dates back to the early 1900s, when unskilled workers were in high demand at the US banana plantations on the Atlantic coast of Honduras and Costa Rica. The Panama Canal construction also demanded workers from all over Central America. Yet, the breakthrough of emigrants to the United States occurred around the 1940s, when labor was scarce while the United States took part in WWII. Unfortunately, no accurate data on emigration is available for these years.

El Salvador in the 1970s was characterized by a fraudulent electoral system, along with a persistent series of coup d’états and the initial phase of the armed conflict. The political instability aggravated the economic conditions, reducing the already limited job opportunities and forcing many young men to migrate to the United States, where a network of Salvadorians had already been established (Funkhouser, 1992; Montes, 1987).

Featuring the most violent confrontation between the military and insurgent groups, the 1980s comprised a decade of rampant violations of basic human rights, political persecution, and stagnant economic conditions. The military conflict in El Salvador propelled the highest rate of emigration in the country’s history. According to an early survey on international migration in El Salvador, only 15 percent of the one million Salvadorans living in the United States had migrated before 1977; the other 85 percent had migrated after 1977, when the country was on the verge of civil conflict (Montes, 1987). International migration during this period was intensified by a devastating earthquake in 1986 that left more than 200,000 families without homes and a shattered infrastructure whose total restoration would require several years.

It was expected that the end of the armed conflict in 1991 would mitigate the massive outflow of people. During the 1990s, not only did political persecution cease, but El Salvador saw for the first time in years a surge in economic growth. A vigorous and dynamic economy resulted from trade openness, privatization, foreign direct investment (FDI), and new job opportunities brought about by the implementation of a variety of economic policies. Paradoxically, the information available on migration tells a different story. According to official sources, 25,000 Salvadorians emigrate each year, mostly to the United States but also to Canada, Spain, and Australia (Gammage, 2006). Evidence supporting this new wave of migration is plentiful. Economic factors such as declines in international coffee and sugar prices tended to reduce working opportunities in rural areas, instigating massive rural migration. Also, family reunifications after the armed conflict and eligibility for temporary residency programs may account for the recent emigration trend (Gammage, 2006). It is important to note that factors driving international migration do not explain remittance inflows; therefore, the next section
describes the remittance trends and cycle nature for the case of El Salvador and the Dominican Republic, countries with similar level of development, population size, and remittances volume.

2.1. The Remittance Path

One of the byproducts of international migration is a rapid growth in remittances. These small private transfers arrive into the hands of millions of families through different conduits. During the 1970s and 1980s, families received their portion of remittances through relatives or private agents who charged a small fee for the physical transfer of funds. However, since the early 1990s, new measures and regulatory institutions have been introduced to reduce the transaction costs of international transfers. In El Salvador, the US dollar was officially adopted as legal tender—a dollarization regime was set in place in January 2001—thus eliminating exchange rate fees and developing healthy competition in the banking sector. Transparency and competition among exchange agents have increased the usage of official venues to send money back to families and friends, thus improving the quality of the data reported by the authorities.

Figure 1 confirms the recent surge in remittances for the two countries under study. The beginning of the twenty first century witnessed impressive growth rates, in which remittances went from about $400 million in 2000 to close to $1 billion nine years later. Salvadorian remittances plunged following the US financial crisis in 2008, closing 2009 with an average negative rate of seven percent with respect to the previous year. In the Dominican Republic, remittances fell from $808.8 million in I-2008 to $742.3 million in I-2009. In terms of business cycle properties, the two series show a positive trend and a seasonal peak during the last quarter of each year (Christmas season).

Figure 1. Remittances: Quarterly Data from 1991 to 2012 (US$ Million)

Source: Central Banks of El Salvador and the Dominican Republic.

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3 In El Salvador, the average monthly sum sent by an immigrant worker is between US$200 and US$300 (Garcia and Palacios, 2008). In the Dominican Republic this amount ranges between $150 and $300 (IDB, 2004).

4 The average cost of a $200 transaction between the US and Dominican Republic fell from 9.5% in 2008 to 6.1% in the first quarter of 2012. El Salvador has maintained an average 5% transaction costs over the past five years (Remittance Price Worldwide, different years. See http://remittanceprices.worldbank.org/).
The cessation of the civil war in El Salvador in 1991 anticipated a major reduction in remittances. Peace not only brought political stability, but also impressive growth rates during the 1990s (Figure 2). Similarly, after a decade of little growth in the Dominican Republic during the tumultuous political unrest of the 1980s, this country experienced a remarkable growth rate of seven percent in the 1995-1999 period as a result of domestic political stability and a world economic expansion that prompted higher tourism and export revenues to the island. The economic expansion experienced in these two nations was also the result of fiscal, monetary, and trade policy adjustments such as tariff cutbacks, the privatization of telecommunication and energy, and foreign investment concessions. More job opportunities were available for semi-skilled workers in the garment manufacturing industry, which would eventually discourage migration. Also, during this period, migrant workers were expected to reduce financial support sent to their families back home, since improved income through new job opportunities and higher wages was anticipated among poor families.

Figure 2. GDP Average Growth: 1980-2011

Surprisingly, remittances steadily grew during these years of economic prosperity. Numerous factors may account for this counter-result. Remittances may be driven by self-interest behavior, in which migrant workers remit more when the economic conditions in the home country provide opportunities for investment and asset acquisition. Also, it became evident, as developmental economists suggest, that a higher GDP does not necessarily imply a better distribution of income. Inequality and poverty were manifested across vast urban and rural areas, as confirmed by most development indicators. Although the governments in these two nations embraced policies toward international trade and free-market institutions, limited export and local production diversification resulted in a shortage of job opportunities for most citizens.

In addition, external factors have jeopardized the income of the poor in these countries. Coffee prices fell from almost US$0.70 per pound in 1989 to less than US$0.30 per pound in 1993, implying a severe fall in rural employment and income. In 2001, coffee prices reached a historical low of US$0.17 per pound and did not recover until
It is not surprising that during these external shocks, poor households used remittances to compensate for income losses.

Moreover, family and friends already living in the United States have facilitated the conditions to welcome new immigrants into the country. Data from the National Census Center in El Salvador indicate that, on average, people are more likely to emigrate if they already have a family member living abroad (Rivera Funes, 2005). Also, the signs of wealth and economic prosperity that immigrants and their families display among the rest of the population tend to accentuate recent migration growth.

In comparative terms, Table 1 shows that total Salvadorian remittances equaled 16 percent of the 2011 GDP value, making El Salvador one of the largest Latin American recipients of remittances. This value was closely followed by six percent in the Dominican Republic. Remittances are not only important in terms of GDP, but also a source of foreign currency as evidenced by the large values in term of exports, FDI, and foreign debt. The information from table 1 calls for a systematic examination of remittances in these two nations.

### Table 1. Remittances and Macroeconomic Variables (2011)

<table>
<thead>
<tr>
<th></th>
<th>Rem (US$ million)</th>
<th>Rem per capita</th>
<th>Rem GDP</th>
<th>Rem Export</th>
<th>Rem Import</th>
<th>Rem FDI</th>
<th>Rem Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Salvador</td>
<td>3,648.7</td>
<td>$590.12</td>
<td>16%</td>
<td>56%</td>
<td>33%</td>
<td>947%</td>
<td>338%</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>3,199.9</td>
<td>$338.79</td>
<td>6%</td>
<td>23%</td>
<td>16%</td>
<td>158%</td>
<td>239%</td>
</tr>
</tbody>
</table>

Note: Author’s calculations using WDI dataset. Values on debt service are from 2010 and the FDI figure for Dominican Republic is from 2010.

### 3. Remittances and Home-Host Country Business Cycles

Over the past few decades, remittances have served as a stable source of external finance to recipient economies, inviting the attention of the research community in exploring the business cycle properties of remittances and the assessment of the impact that host and home-country economic conditions have on remittances. Finding evidence of long-term relationships among these series would lead to more adequate policy options addressing remittance inflows in countries with a high dependence on these foreign transfers.

Reviewing the theory on the motives to remit might guide us to adequate testable hypotheses. Rapoport and Docquier (2005) propose a comprehensive theoretical foundation in which motives for transferring income from the host to the home country are related to individual, household, and macroeconomic factors. Remittances could be the result of altruistic behavior in which the immigrant worker cares for the wellbeing of family members left behind; therefore, any shock against family income would be compensated by more remittances. Specifically, during economic recessions, family members tend to suffer a temporary contraction in income and consumption, thus prompting higher request of remittances from family members working abroad.

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5 These were prices paid to domestic producers, and were retrieved from the database of the International Coffee Organization (ICO).
Remittances might also serve as financial instruments that smooth the consumption of the sender. In this case, an expansionary cycle would induce more investment-related remittances such as those in real estate, land, livestock, and small business acquisitions.

Remittances could be repayments of a predeparture debt associated with international travel, or a partial solution to the pernicious liquidity constraints among the poor (Schrieder and Knerr, 2000). Each of these motives to remit—altruism, investment, or debt—can coexist within a country and lead to a pro or counter-cyclical relationship with the home country’s GDP. Thus far, empirical studies have provided us with interesting insights, but have also unleashed an ongoing debate about the motives to remit (Borja, 2012a).

The body of empirical work assessing the reasons behind “sending money back home” is growing, but data availability is still limited, and the results of econometric estimations are overly sensitive to slight changes in time and country datasets. Problems are exacerbated when the data of numerous countries are aggregated to empirically contest the relationships between remittances and home and host countries’ output. For instance, Chami et al. (2005) and Chami et al. (2008) collected panel data on more than 100 countries and found cross-country evidence that remittances are motivated by altruistic factors (i.e., compensatory transfers) more so than investment factors (i.e., profit-driven transfers). However, Giuliano and Ruiz-Arranz (2009), also compiling a panel dataset of 100 countries, found that the investment or self-interest motive might explain remittance inflows in two thirds of the countries under their study.

Yang (2008) and David (2010) each investigated the impact of natural disasters on remittances, concluding that these transfers increase during and after natural disasters; but such results were stronger and more persistent among low-income countries. These authors provide persuasive explanations for such results. For instance, poor countries are severely limited in the array of financial instruments available to protect their population from income volatility; thus, remittances become key devices in smoothing consumption during difficult times. Roache and Gradzka (2007) analyzed the correlation between the cyclical component of 19 US economic indicators and remittances for 14 Latin American nations, concluding that most correlations were close to zero. However, once each country is evaluated independently, some countries exhibited significant correlation values. Subsequently, these authors estimated VECMs and confirmed that El Salvador, Brazil, and Peru show stable long-term relationships between remittances and the US GDP.

Vargas-Silva and Huang (2006) investigated the cyclical correlation between the home-country and US GDPs and remittances for five selected Latin American countries. Through the application of a VECM, they found that these foreign transfers respond to US GDP, but not to the home country’s output. However, this research has a methodological caveat: an index of the weighted average of the economic conditions of the five selected countries (defined as ROW) serves as the input variable in the model, concealing specific characteristics of each country and potentially reducing the validity of the results. In fact, the authors explain that “migrants from different countries can be reacting differently to the changes in the economic conditions of the host and home country. As a consequence, using these aggregate data could be affecting our results” (pp.92).
Sayan (2006) evidences counter-cyclical behavior between remittances and domestic GDP for a group of 12 remittance-recipient countries, but this result vanishes once each country is analyzed individually. Eight of the 12 countries examined show acyclical or no relationship between remittances and domestic GDP.

Since the motives to remit are complex, country-specific studies might serve as a finer approach, unmasking important features not observed in more general examinations (Sayan, 2006). Vargas-Silva (2008) and Castillo-Ponce et al. (2011) focus their attention in the case of Mexico and find long-term cyclical correlations between remittances and macroeconomic variables such US unemployment, exchange rates and Mexico’s GDP and inflation rate. Gupta (2005) observes that US business cycles, measured in terms of US employment, positively affect India’s remittances, but the counter-cyclical effect of India’s GDP and remittances was somewhat frail. In another study, Sayan (2004) indicates that there is no significant relationship between Turkey’s remittances and Germany’s business cycle, but that there is a strong positive correlation with Turkish national output.

In the particular case of El Salvador, Borja (2012b) derives a series of IRFs and concludes that Salvadoran remittances move in tandem with the US economy. These results post a current dilemma for small nations with large remittance-to-GDP ratios: the United States has recently experienced more frequent and stronger economic downturns than in previous decades, which might contribute to higher volatility in remittance inflows in the coming years.

On the other hand, remittances seem to be resilient regardless domestic conditions; perhaps senders keep close ties to family members they left behind, or altruistic and investment motives interact simultaneously. We investigate these hypotheses by assessing the impact that the GDP of the United States, El Salvador, and the Dominican Republic have on remittances; but different from previous studies, we use a more comprehensive dataset and use both restricted and unrestricted VAR models as robustness measures.

3.1. Model and Data Specifications

The remainder of this study describes the cyclical properties of remittances and their link to the host’s and home’s business cycles using VAR and VECM. VAR models are extremely useful tools in forecasting the impact of random disturbances on a system of variables and addressing issues of endogeneity and collinearity, since they do not require assumptions about causality effects among variables. Previous empirical work (Caceres and Saca, 2006; Ziesemer, 2010) suggests that remittances may also impact domestic output and other macroeconomic variables, contemporaneously as well as lagged; therefore, VAR models seem to be an appropriate approach in this case.

We develop a VAR model of the form:

\[ y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + \varepsilon_t \]  

where \( y_t \) is a vector of endogenous variables that includes Salvadorian remittances (ESREM); the US GDP (USGDP); El Salvador’s GDP (ESGDP); and coffee prices (COFFEE). It is anticipated that a drop in coffee prices would increase rural unemployment, thus jeopardizing the incomes of rural families. In turn, those families with members working abroad might request more remittances as a way of coping with income volatility. If more remittances stem from lower coffee prices, evidence would
suggest the altruistic motive to remit. Model (1) is re-calculated for the case of the Dominican Republic (DRREM and DRGDP indicate Dominican Republic’s remittances and GDP respectively).

The values of $A_1, \ldots, A_p$ and $\beta$ are matrices of coefficients to be estimated, and $\epsilon_i$ is a vector of errors. Errors can be correlated with each other, but must be uncorrelated with their own lagged values and the variables specified in the $y$ vector. Finally, $p$ represents the number of lags and $t$ the number of periods. Natural logarithms are applied to all variables.

The specific hypothesis tested is whether remittances are affected by contemporaneous and lagged values of the host’s and home’s GDP. The US economy is defined as the host country since most remittances of the two countries under study flow from the US. The dataset used contains quarterly values from I-1991 to II-2010 (86 observations). Data on remittances and domestic GDP were retrieved from the central banks, while coffee prices were obtained from the database of the International Coffee Organization (ICO). Data on remittances for the Dominican Republic is available from I-1998 until II-2012 (58 observations).

Table 2. Lead and Lag Correlation between Remittances and Host-Home GDP

<table>
<thead>
<tr>
<th>El Salvador: Correlation between remittances and…</th>
<th>t-4</th>
<th>t-3</th>
<th>t-2</th>
<th>t-1</th>
<th>t</th>
<th>t+1</th>
<th>t+2</th>
<th>t+3</th>
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<tbody>
<tr>
<td>El Salvador GDP</td>
<td>0.31</td>
<td>0.41</td>
<td>0.53</td>
<td>0.43</td>
<td>0.48</td>
<td>0.34</td>
<td>0.29</td>
<td>0.06</td>
<td>0.00</td>
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<tr>
<td>US GDP</td>
<td>0.29</td>
<td>0.46</td>
<td>0.62</td>
<td>0.67</td>
<td>0.68</td>
<td>0.61</td>
<td>0.53</td>
<td>0.42</td>
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<td>Dominican Republic: Correlation between remittances and…</td>
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<tr>
<td>Dominican Republic GDP</td>
<td>0.26</td>
<td>0.27</td>
<td>0.43</td>
<td>0.34</td>
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<td>GDP</td>
<td>0.14</td>
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<tr>
<td>US GDP</td>
<td>-0.03</td>
<td>0.04</td>
<td>0.17</td>
<td>*</td>
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<td>*</td>
<td>*</td>
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Note: Each series was transformed to natural logs and seasonally adjusted. The correlation values are based on business cycle series in which the trends were removed. The business cycle series were extracted using a Hodrick-Prescott filter. The value $t-i$ indicates a lag of $i$ periods on remittances and the $t+i$ indicates a lead of $i$ periods on remittances. The * indicates that the correlation value is statistically significant at 95 percent level.

Preliminary evidence of the co-movement between the host and home country economies and remittances can be outlined by assessing the lag and lead correlations of the business cycle component of the series. Table 2 shows that remittances are positively correlated with the domestic GDP and the US GDP. For instance, Salvadorian remittances show a 0.48 correlation factor with the domestic GDP and 0.67 with the US GDP. These correlations continue to be statistically important after three lags and two leads of the remittance series. Similarly, Dominican Republic’s remittances inflows show a positive contemporaneous correlation with the US GDP (0.31) and the domestic economy (0.43). However, most of the lag and lead correlations are fairly low and statistically irrelevant.
3.2. Empirical Results

The empirical study undertaken here follows four standard steps. First, the Augmented Dickey–Fuller (ADF) and other tests are applied to detect nonstationarity or to test formally for the presence of unit-roots in the series. Second, we produce non-stationary series of the same order and test for possible cointegrating vectors or long-term relationships among the series. Third, tests are applied to determine the lag length of the VAR model. Finally, we estimate VARs, VECMs, and several IRFs from which we assess the impact of the GDPs of the United States, El Salvador, and the Dominican Republic on remittances.

The ADF tests confirm that the series are non-stationary with order-one integration. Most tests point toward two lags, but under certain conditions, some tests show four lags as the appropriate value-lag for the model. We run model (1) using two and four lags.

The next step consists of assessing the existence of at least one cointegrating vector. If the evidence confirms it, the adequate model would be a restricted VAR model with an error-correction term, or a VECM. The critical values call for the application of a VECM in most of the cases; therefore, IRFs are generated using both a VECM and an unrestricted VAR model.

The IRFs offer information about the sign and time-trajectory of remittances stemming from a random disturbance on any of the variables in the system. Figures 3 and 4 report the major findings under two sets of IRFs: an unrestricted VAR model and a VECM. The response of Salvadorian remittances after a positive shock to the US GDP, coffee prices, and domestic GDP indicates a strong positive relationship with the US business cycle (Figure 3-1 and 3-4), a limited relationship with coffee prices (Figure 3-2 and 3-5), and a counter-cyclical relationship with the domestic economy during the first two quarters after the shock (Figure 3-3 and 3-6).

The upper and lower boundaries are two standard deviation confidence intervals, which are expected to diverge from the zero value if the impact is statistically relevant. As evidenced in Figures 3-1 and 3-3, the US GDP shows a statistical positive impact on remittances with a striking ascent during the first three periods after a positive shock to the US GDP.

Following a positive shock to El Salvador’s GDP, remittances initially respond negatively, but the effect seems to dissipate after the third quarter. Subsequently, remittances move in waves around the zero zone (Figure 3-3) or around the negative-values region (Figure 3-6). In this regard, migrants appear to remit more during periods of economic distress, but this effect is moderately small and statistically irrelevant during the 10 quarters under analysis.

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6 Cointegration occurs when the trend in one variable can be represented as a linear combination of the trends in the other variables within the system. If this is the case, it is recommended to adjust the model by using a VECM.

7 Tests using El Salvador’s data are fairly stable at two lags and show partial evidence of cointegrating vectors. In the case of the Dominican Republic, half of the tests indicate two lags and the other half point toward four lags. Stationary, lag, and cointegration test results are not presented in the paper, but they can be retrieved from the author upon request.
Figure 3. El Salvador: Response of Remittances to a Positive Shock in US GDP, Coffee Prices, and Domestic GDP

**VAR**

- Response of remittances to a positive shock in US GDP
- Response of remittances to a positive shock in coffee prices
- Response of remittances to a positive shock in domestic GDP

**VECM**

- Response of remittances to a positive shock in US GDP
- Response of remittances to a positive shock in coffee prices
- Response of remittances to a positive shock in domestic GDP

Notes: The horizontal value indicates the number of quarters and the vertical value shows remittance changes due to one standard deviation shock to US GDP, Coffee Prices, and, domestic GDP. The boundaries indicate 95 per cent confidence intervals. The VAR and VECM use one interval and two lags of all the endogenous variables as the right-hand variables. All variables in the system are in first-difference.

Coffee prices seem to have a relatively small impact on remittances; the confidence band contains the zero-zone in all 10 periods following the initial shock (Figures 3-2 and 3-5). Such lack of statistical evidence could be explained by a counter-effect observed in rural communities: after a period of high coffee prices, poor families experience higher income that can finance the migration costs for another family member, thus leading to future increases in remittances.

Figures 4-1 and 4-4 illustrate a solid positive response of Dominican Republic’s remittances after a positive shock in US GDP, but this effect faints after the first quarter. Positive shocks in coffee prices and domestic GDP have limited or no impact on remittances. Remittance response is statistically insignificant for all the periods under study (Figure 4-2, 4-3, 4-5, and 4-6). Different from the case of El Salvador, a random shock in the Dominican Republic’s GDP has an initial positive impact on remittances, but it rapidly moves toward the negative and the zero zones (Figure 4-3 and 4-6).
Figure 4. Dominican Republic: Response of Remittances to a Positive Shock in US GDP, Coffee Prices, and Domestic GDP

**VAR**

- Response of remittances to a positive shock in US GDP
- Response of remittances to a positive shock in coffee prices
- Response of remittances to a positive shock in domestic GDP

**VECM**

Notes: The horizontal value indicates the number of quarters and the vertical value shows remittance changes due to one standard deviation shock to US GDP, Coffee Prices, and domestic GDP. The boundaries indicate 95 per cent confidence intervals. The VAR and VECM use one interval and two lags of all the endogenous variables as the right-hand variables. All variables in the system are in first-difference.

### 3.3. Robustness Tests

Results from the IRFs depend on the order in which the variables are included in the system; thus, for robustness purposes, a new estimation using a different order was completed. The Cholesky decomposition order from the VAR model was changed from \([\text{USGDP, COFFEE, ESGDP, ESREM}]\) to \([\text{ESREM, USGDP, COFFEE, ESGDP}]\) for the case of El Salvador and from \([\text{USGDP, COFFEE, DRGDP, DRREM}]\) to \([\text{DRREM, USGDP, COFFEE, DRGDP}]\) for the case of the Dominican Republic. The assumption here is that variables entering the model earlier in the VAR are considered more exogenous. In general, the results do not change considerably. For both countries, remittances move in tandem with the US output and this effect is statistically relevant during the first three quarters for the case of El Salvador (Appendix 1). During the first quarter after a positive shock in El Salvador’s GDP, remittances move counter-cyclically.
Borja, K. *Home and Host Country Cycles and Remittances in El Salvador and The Dominican Republic* (Appendix 1). This counter-cyclical behavior is observed during the second and fourth quarters for the case of the Dominican Republic (Appendix 2).

In addition, we conducted VAR and VECM using four lags instead of two lags within the system. This approach reduces the number of observations, thus statistical tests must be interpreted with caution. The objective of this exercise aims at corroborating the general behavior of remittances after a positive shock in US GDP and the domestic output of El Salvador and the Dominican Republic. The results, although more volatile, are in line with those observed in Figures 3 and 4 (Appendixes 3 and 4).

Specific household behavior, immigrant incentives to remit (altruistic versus investment motives), job opportunities at home, and the degree of integration into the US economy contribute to the complexity of remittance inflows. All these reasons may shape remittances in El Salvador and the Dominican Republic, but statistically, we found a positive link between remittances and the US GDP to be a relevant factor. Remitters in these nations are affected more by US economic conditions than by domestic business cycle when deciding to remit.

4. **Conclusions**

This study briefly reviewed Salvadorian worker migration over the past century. It also described the patterns of remittance performance and trends for the case of El Salvador and the Dominican Republic. Evidence indicates a surge in remittances as a source of foreign income among the poor. Currently, remittances per capita represent $590 and $339 in El Salvador and the Dominican Republic respectively, values well above the minimum rural wage in both nations.

We take the analysis of remittances one step further by estimating restricted and unrestricted VAR models and by assessing the co-movements between remittances and the host and home countries’ business cycles. From the econometric analysis, remittances show a positive relationship with the US economy, which harmonizes with preliminary data observation.

Altruistic behavior is displayed only for the case of El Salvador. Remittances seem to respond rapidly to negative shocks in the home-country economy, compensating for lower income and consumption among family members back home. However, this effect is fairly close to zero. In general, remittances do not statistically respond to domestic economic shocks; thus, we established a partial validation of the counter-cyclical movement of remittances and the domestic economies of El Salvador and the Dominican Republic. An explanation for this result could be that altruistic and investment motives work simultaneously as reasons for remitting.

Several robustness checks were developed to overcome some of the shortcomings stemming from the limited number of observations. In particular, restricted and unrestricted VAR models were used to derive the IRFs. Also, two different sets of ordering were used to re-calculate the IRFs, and different lag periods were used to re-estimate the models. The co-movements between remittances and the home and host countries’ business cycle remain practically unaltered by these changes.

The results from this empirical research have important implications for domestic policy development in these two nations. First, it is central to setting out an economic environment that appeals to workers, and therefore to reduce future migrations and dependence on exports of labor to the United States. The fact that the US economy...
significantly affects workers’ remittances does constrain opportunities for policymakers in influencing remittance inflows. Nonetheless, government officials can focus on regulations that enhance the usage and productivity of such transfers, once they are circulating in the domestic economy. Efforts to reduce transaction costs and promote competition among banks and money exchange houses must continue. Expanding already-existing “matching funds” programs for local development projects financed by migrants’ funds, and investing in infrastructure such as roads, public transportation, and technical assistance are promising areas of public influence (Gammages, 2006; Borja, 2012b).

The somewhat mixed result on the relationship between domestic GDP and remittances deserves further investigation. Surveys and interviews with immigrants and family recipients may complement our study, since they would gather additional information on the specific characteristics and incentives that migrant workers have at the time of sending money back to their home countries. However, studies using micro-data face several limitations in terms of selection and omitted-variable bias, both of which the current study was able to circumvent.

References


Borja, K. *Home and Host Country Cycles and Remittances in El Salvador and The Dominican Republic*


**Appendixes**

**Appendix 1. El Salvador: Response of Remittances to a Positive Shock in US GDP, Coffee Prices, and Domestic GDP Using a Different Order of the Series VAR**

**VECM**

Notes: The horizontal value indicates the number of quarters and the vertical value shows remittance changes due to one standard deviation shock to US GDP, coffee prices, and, domestic GDP. The boundaries indicate 95 per cent conﬁdence intervals. The VAR and VECM use one interval and two lags of all the endogenous variables. All variables in the system are in ﬁrst-difference. The Cholesky Decomposition Order 1 = USGDP, COFFEE, ESGDP, ESREM. The Cholesky Decomposition Order 2 = ESREM, USGDP, COFFEE, ESGDP.
Appendix 2. Dominican Republic: Response of Remittances to a Positive Shock in US GDP, Coffee Prices, and Domestic GDP Using a Different Order of the Series

\textbf{VAR}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{var_dominican_republic}
\caption{Response of remittances to a positive shock in US GDP, coffee prices, and domestic GDP using a different order of the series.}
\end{figure}

\textbf{Notes:}\ The horizontal value indicates the number of quarters and the vertical value shows remittance changes due to one standard deviation shock to US GDP, coffee prices, and domestic GDP. The boundaries indicate 95 per cent confidence intervals. The VAR and VECM use one interval and two lags of all the endogenous variables. All variables in the system are in first-difference. The Cholesky Decomposition Order 1 = USGDP, COFFEE, DRGDP, DRREM. The Cholesky Decomposition Order 2 = DRREM, USGDP, COFFEE, DRGDP.

Appendix 3. El Salvador: Response of Remittances to a Positive Shock in US GDP, Coffee Prices, and Domestic GDP Using Four Lags

\textbf{VAR}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{var_el_salvador}
\caption{Response of remittances to a positive shock in US GDP, coffee prices, and domestic GDP using four lags.}
\end{figure}
Notes: The horizontal value indicates the number of quarters and the vertical value shows remittance changes due to one standard deviation shock to US GDP, coffee prices, and domestic GDP. The boundaries indicate 95 per cent confidence intervals. VAR(1,2) and VECM(1,2) indicate one interval and two lags of all the endogenous variables. VAR(1,4) and VECM(1,4) indicate one interval and four lags of all the endogenous variables. All variables in the system are in first-difference.

Appendix 4. Dominican Republic: Response of Remittances to a Positive Shock in US GDP, Coffee Prices, and Domestic GDP Using Four Lags

VAR

Notes: The horizontal value indicates the number of quarters and the vertical value shows remittance changes due to one standard deviation shock to US GDP, coffee prices, and domestic GDP. The boundaries indicate 95 per cent confidence intervals. VAR(1,2) and VECM(1,2) indicate one interval and two lags of all the endogenous variables. VAR(1,4) and VECM(1,4) indicate one interval and four lags of all the endogenous variables. All variables in the system are in first-difference.