2019

Analyzing the impact of workers' remittances on household consumption in Latin American and Caribbean Countries

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Abstract

Increasing remittance flows to developing countries continue to stimulate analytical research. We apply a model, based on the "permanent income hypothesis", to estimate the impact of remittances on consumption in eleven Latin American and Caribbean countries for the period of 2003–2013. The independent variables are: (a) real per capita national income (exclusive of remittances), the measure of "permanent income", (b) remittances, the measure of "transitory income", and (c) real interest rate, the indicator of intertemporal consumption substitution. The coefficient of remittances measures the consumption-augmentation and saving effects, while the correlation between remittances and per capita income indicates the consumption-smoothing effects. The results, based on the panel data methodology, indicate: (a) both permanent income and transitory income positively impact consumption, (b) consumption responds higher to permanent income than to transitory income, (c) transitory income has augmenting, stabilizing and countercyclical effects on consumption, and (d) the significant interest rate indicates the ability of recipients to make intertemporal consumption substitution. Evidence of significant "country effect" attests to heterogeneity among countries. Strategies to stabilize remittance flows and to leverage them for financial, economic and social development should be important policy considerations.

1 Introduction

The impact of remittance flows on the economy of recipient countries continues to stimulate current research, for example, Grigorian and Kryshko (2017), Barajas et al. (2009), Fajnzylber and Humberto-Lopez (2008), and Goldberg and Levi (2008).[1] Recent studies focus on several issues: (i) Gabriela-Mundaca (2009) on economic growth, (ii) U CTAD (2011) and Adams and Page (2005) on the poverty level (iii) Aggarwal and Demirguc-Kunt (2006) on financial sector development, (iv) Lueth and Ruiz-Arranz (2006) on the determinants of flows, (v) eagu and Schiff (2009) on the stability, cyclicality and stabilizing impact, and (vi) Yang (2006) and Yang and Choi (2007) on consumption smoothing.[2] A topical issue is the impact of remittances on consumption, specifically as related to consumption augmentation, smoothing and volatility, and the potential Keynesian multiplier effect on the economy. The World Bank (2015) has examined ways that remittances can help promote consumption stability. In recent several countries have implemented economic liberalization policies that inter alia, target consumption driven growth.

Previous studies, World Bank (2006a) and Adams (2006), are supportive of the consumption-increasing and poverty- reduction effects of remittances, these results, however, are based on survey data and the analysis of descriptive statistics. We extend the literature by using amore analytical methodology. We empirically estimating a consumption behavior model pecified within the framework of the "permanent income hypothesis" (PIH), originally articulated by Friedman (1957) and Modigliani (1976), to analyze the impact of remittances on consumption pattern in eleven Latin American and Caribbean (LAC) countries for the period 2003–2013. The PIH relates consumption to permanent and transitory income. The theoretical model is justified on the basis of several analytical studies of the PIH, some include Willassen (1978), Hall and Mishkin (1982) and Kreuger and Perri (2008). They have applied (and tested the validity of) the PIH to analyze consumption behavior using different measurement of income (transitory and permanent).

We use several panel data models (Restricted, Unrestricted-Fixed Effects, Fixed Effects and Random Effects) and perform diagnostic tests to validate the results. The independent variables are: (i) real per capita national income (exclusive of remittances) as the measurement of "permanent income", (ii) remittances as "transitory income" and (iii) real interest rate (the opportunity cost of money). We justify the use of these variables within the framework of the PIH later in the paper. The interpretation of the results i as follows: (i) the coefficient of remittances (transitory income) measures the consumption augmentation and saving effects; (ii) the correlation between remittances (transitory income) and real per capita income (permanent income) indicates the cyclical effect; a low (or negative) correlation is considered counter cyclical and a positive (or high) correlation pro-cyclical; also a negative correlation is indicative of the

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[1] Migrant remittances are defined as the sum of workers' remittances, compensation of employees, and migrants' transfers. Workers' remittances, as defined by the International Monetary Fund (IMF) in the Balance of Payments Manual, 6th edition (IMF 2010), are current private transfers from migrant workers who are considered residents of the host country to recipients in the workers' country of origin.

[2] The Multilateral Investment Fund (2006) also lists the following potential impact of remittances on the regional economy of Latin America and Caribbean; (i) insurance investments, (ii) banking investments, (iii) housing investments, (iv) educational investments, (v) microfinance institution loans, (vi) direct payments, and re credits.

consumption smoothing effect of remittances, and (iii) the significance of real interest rate indicates the ability of households (recipients) to make intertemporal substitution in consumption through savings and the accumulation of assets.

We use data for the period 2003–2013 for eleven Latin American and Caribbean (LAC) countries Colombia, Costa Rica, Ecuador, Mexico, El Salvador, Guatemala, Honduras, Dominican Republic, Jamaica. Nicaragua, and Panama. The choice of these countries is based on several factors: (a) *International Migration Outlook* (OECD 2006) lists them as the largest recipients of remittances in the region, and (b) the relevant data are available for them, unlike some other countries of the region. The choice of the period has to do with the availability of published data on a country basis (a) the *World Bank* began publishing data in the early 2000 and on a country basis in 2003 (sec *Migration and Remittances Fact Book* 2011); (b) the latest edition (*Migration and Development Brief, World Bank* 2015) and *Migration and Remittances Factbook* (World Bank 2006a, b) have only preliminary estimates of remittances for 2014 and 2015; and (c) *International Financial Statistics (IMF* 2015), has many recent data missing on exchange rates, inflation rates, and interest rate for some countries. These countries constitute a group with different levels of GDP, consumption, population, and remittances Appendix Table 3 provides important ratios on consumption/GDP, per capita GDP, per capita remittances, and remittances/GDP over the same period. The high consumption/GDP and remittance/GDP ratios justify the importance of this study. Remittance flows to developing countries continue to increase after the current global recession; officially recorded flows are estimated to have reached $430 billion in 2014, an increase of 3.2% over 2013 (see Appendix Table 4). Flows to LAC countries reached $64 billion in 2014, this amount comprises about 15% of total flows to developing countries. The LAC region receives over 75 % of its remittances from the United States, thus these flows are susceptible to USA economic cycle and regulatory policies.

The findings of this study have important policy ramifications regarding consumption stability and the leveraging of remittances to improve the economic and social development of recipient countries. This is consistent with the achievement of the Sustainable Development Goals (United Nations 2015) of eradicating extreme poverty and hunger. The Economic Commission for Latin America and the Caribbean (2014) notes that in recent years an increase in household income in the region has resulted in a striking rise in consumption, however, the consumption pattern is strongly pro-cyclical and volatile; this has exposed the economies of the region to greater vulnerability. There are also significant concerns regarding the volatility (risk factors) affecting remittance flows to the region: (a) the economic crisis in the USA had a dampening impact on migrants' income, prompting them to decrease the frequency of their transfers, and (b) regulatory factors, for example, current immigration reform policies enacted by the Trump administration that could impact the number of immigrants from LAC in USA.[3]

The rest of the paper includes the following: Section 2 reviews of the literature on the PIH; Section 3 analyzes the recent trend in remittance flows; Section 4 discusses the impact of remittances, economic, and consumption; Section 5 discusses the data and the statistical properties; Section 6 discusses the specification of the model; Section 7 discusses the empirical results and the ramifications; Section 8 provides the conclusion.

2 Relevant literature: Permanent income hypothesis

2.1 Permanent income hypothesis

This paper encompasses a large literature (originally articulated by Friedman 1957 and Modigliani 1976) on the determinants of household consumption. The main independent variables of these studies include: (i) current income, (ii) expected future income, (iii) wealth, and (iv) interest rate. The PIH assumes that consumers: (i) prefer a smooth pattern of consumption, (ii) are farsighted and have a clear vision (no uncertainty) about future income, and (iii) are able to borrow. On the basis of this set of assumptions, they are able to maximize "lifetime" or permanent consumption. According to the PIH, the observed value of consumers income (Y^O) comprises two components, permanent income (Y^P) and transitory income (Y^T); Y^P includes current income plus expected income from various forms of assets, Y^T is windfall gains measured by (Y^O - Y^P). Consumers form an estimate of Y^P and assign an appropriate fraction for consumption; Y^T doe not affect consumption since its expected value equals zero; also Y^T and Y^P are uncorrelated. The life cycle hypothesis (LCH) is partly built on the PIH and focuses on consumption planning over life time, i.e. the choice between current consumption and future consumption. If consumers' current income (Y^C) is relatively higher ($Y^C > Y^P$), there is saving to be used for future consumption; borrowing occurs if ($Y^C < Y^P$) thus consumption smoothing takes place through borrowing and saving which are determined by the real interest rate.

A topical area of research is the role of transitory income on consumption based on the PIH which assumes that transitory income is "windfall gains" (the random variation from average income) and is non-correlated with consumption.[4] Earlier studies, Doenges (1966) and Kreinin (1961), examine the marginal propensity to consume (MPC) between transitory income and permanent income, they have arrived at different conclusions. Other studies articulate the rationale for a positive MPC of transitory income; Willassen (1978) argues that if the "windfall gains" (transitory income according to PIH) are anticipated, they should be incorporated in recipients' budget plans and should not be regarded as a random variable. A common problem with these studies is how to estimate or separate the transitory component of income. Hall and Mishkin (1982) examine the sensitivity of food consumption to transitory-income; they report the significance of transitory income measured by a stochastic component of real lifetime income. Their major findings are: (i) consumption responds much more strongly to permanent rather than to transitory movement in income, (ii) the response to transitory income is vigorous if the interest rate is included in the model, and (iii) a rejection of the pure life-cycle/PIH hypothesis.

2.2 Empirical studies of the PIH

Several studies, including Laumas (1969) and Holmes (1974), have documented the measurement of Y^P and Y^T as a significant problem in the empirical estimation of the

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[4] The PIH postulates the following: (i) non-correlation between the transitory and permanent component of income, (ii) non-correlation between transitory consumption and permanent consumption, (iii) non-correlation between transitory consumption and transitory income.

PIH. Hall (1978, page 971) notes "the major problem in empirical research based on the hypothesis has arisen in fitting the part of the model that relates current and past observed income to expected future income;" additionally, (page 972) "much empirical research is seriously weakened by failing to take proper account of the endogeneity of income when it is the major independent variable in the consumption function." Lucas (1976) argues that there is no theoretical reason for expectations formed by reasonably intelligent economic agents about future variables to be adequately explained by past data in a stable manner. Carlin and Soskice (2005) contend that it is necessary to relax some of the assumptions of the PIH in order to account for the empirical behavior of consumers' expenditures because of the uncertainty about future income and the limited access that some households have to financial markets. The conventional practice in the literature, as noted by Hayashi (1982), has been to proxy permanent income by current or past disposable income. Hall and Mishkin (1982) and Kreuger and Perri (2008) use values for Y^P and Y^T that are different from those discussed in the theoretical PIH.

Our methodology contributes to the current empirical literature by analyzing different sources of income flows that could be clearly classified as Y^P (real per capita income exclusive of remittances) and Y^T (remittance flows) and theoretically justified. The impact of real interest rate which allows for saving and borrowing, a la the Life Cycle Hypothesis (Modigliani 1976) is also examined since it enables an examination of the consumption smoothing effect. The World Bank (2006a, b, p.125) notes that remittances are viewed by households as transitory income rather than permanent and should be saved rather than currently spent. The results of this study also enable us to test the validity of this argument. One limitation of the model is that it is applied to countries with inadequate published data on consumers' ownership of different forms of assets (wealth) and imperfect financial and labor markets.

3 Recent trend in remittance flows

Appendix Table 4 shows that since the recent global financial crisis, remittance flows to all six developing regions begin to increase although the growth rate for each region varies.[5] Total remittance flows to all developing countries are estimated to have reached $430 billion in 2014, up 4 % over 2013. UNCTAD (2011) also reports that remittances through informal channels could add at least 50 % more to the recorded official flows. India, China, and Mexico were the top recipients in 2011 in terms of billions of dollars; however, there are other countries with high remittances/GDP, for example, Tajikistan (31%), Guyana (22%), Haiti (21%), and El Salvador (16%). The US is the largest source of remittances, followed by the Russian Federation, Saudi Arabia and Switzerland. The largest group of remitters has been US-residing Latin Americas with a disproportionate share going to Mexico.

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[5] There are several factors that affect the amount of remittance flows: (i) economic conditions in migrant destination countries (host countries), (ii) migrant population and migrant unemployment rate in host countries, (iii) the average wage rate for migrant workers in host countries, (iv) the level of family needs in recipient countries, (v) the economic conditions in recipient countries which affect needs and possibility for out migration, and (vi) remittance transfer costs.

There are several factors that have positively impacted remittance flows: and (i) increased immigration to developed countries; (ii) international agreement to decrease the cost of transferring remittance,[6] (iii) high oil prices once generated an increase in remittance flows from Russia to Central Asia, and from the Gulf region to South and Southeast Asia, and (iv) currency changes and inflation rates in some recipient countries. Many studies note financial markets reform as an incentive for sending remittances; Grigorian and Kryshko (2017) mention that the availability of deposit insurance encourages the use of formal channels for transmitting remittances. The impact of the global financial crisis varies from region to region depending on the regional diversification of the sources of remittances (IMF 2009). Policies to enable remittance flows to absorb macroeconomic shocks are crucial. Several studies (Barajas et al. 2010) have analyzed the risk/volatility of remittance flows and its economic impact.

4 The impact of remittances

4.1 Economic impact

The importance of remittances is well documented in the literature; the focus is on the household and the economy. The impact on growth depends on the motives for remitting; according to Chami et al. (2005) the non-profit motive (humanistic) depresses growth, while the profit driven motive increases growth. Importantly, Goldberg and Levi (2008) notes that the remittances/GDP ratio a measure of the growth effect) tend to vary significantly among the largest recipients. Several studies, including Faini (2002), Ekanayake and Mihalis (2008) and Spatafora (2005) examine the linkages between remittances, trade, consumption, investment and economic growth, and they obtain mixed results. Aggarwal and Demirguc-Kunt (2006) report that remittances also contribute to considerable financial deepening due to an increase in deposits and credits in the local banking industry. Many studies (Yang 2004, Mishra 2007, and Acosta et al. 2008) note a negative relationship between remittance flows and the labor force participation rate, however this may allow recipients to engage in other productive domestic household activities.

Two major studies examine the impact of remittances on output shocks, a phenomenon known as *risk sharing* (income smoothing). Balli and Rana (2015) find that remittances provide insurance against domestic output in eighty-six developing countries over the period 1990–2010. Balli et al. (2013) also report that the less developed (non-oil) Middle Eastern and North African (MENA) countries experience substantial income smoothing from remittances, unlike the oil rich Gulf countries.

4.2 Remittances and consumption

By increasing the income of recipients, remittances can lead to changes in savings, expenditure patterns, and household behavior. There are several factors that impact the

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[6]
Goldberg and Levi (2008) note that costs can be very high as we found in out from existing studies ranging from 10% to 12% + depending on the amount transferred and the transfer agent. The Inter-American Development Bank (2009), dealing with remittances from the US to Latin America showed that the cost of remitting funds had dropped sharply to US$16.32 for a US$200 transfer in the summer of 2002, just over half s three years earlier.

pattern of expenditure (propensity to consume, save and invest): (a) the level of income and social-economic background, and (b) location, (urban-rural). The result of a comparative study indicates that recipients from low income groups have a higher marginal propensity to save than non-recipients. Another survey shows that different income groups in different countries (and regions, urban-rural) spend different portion of remittances on food, non-durables, durables, housing, education, and health. Several studies are supportive of the impact of remittances on consumption augmentation and smoothing. We contend that a negative correlation between remittances and real per capita income is counter cyclical, that it, remittance flows increase during economic slowdown, in recipient countries. This tends to have a consumption smoothing effect. UNCTAD (2010) notes the following: (i) expenditures on household consumption represent about 70 % of the amount transferred; (ii) remittances make up over 50 % of recipients' total household income, and (iii) a positive multiplier effect on the economy because of the consumption of locally produced goods.

Maximizing the benefits of remittances by household entails a *risk minimizing strategy* because of the volatility in the factors affecting the determinants of remittance flows. Acosta et al. (2008) list two important risk reduction strategies: (i) the ex-ante risk coping mechanism, necessitating part of remittances to be saved and sources of income must be diversified to enable consumption smoothing; and (ii) the ex-post reaction to negative shocks, or the counter-cyclicality of remittance flows, necessitating recipients may request migrants to increase remittances in recession period or encourage the emigration of other family members.

4.3 Remittances, consumption and growth in LAC

Remittance flows to LAC countries increase steadily from 2001 ($21.9 bil. US) to 2008 ($64.3 bil. US); they decrease to $56.5 bil. in 2009 the peak of the economic crisis in the USA then increases slowly to $61.3 bil. in 2013. Flows to LAC countries as a percentage of flows to all developing countries decrease from 19.75% in 2008 to 14.59% in 2013.

Studies of the LAC region focus on several issues: (i) Adams (2006) report that recipients in Guatemala tend to spend a lower share of total remittances on food and other non-durables, and more on housing, education, and health, (ii) Gonzalez (2009) finds positive impact of remittance flows on the balance of payments and economic growth; Adelman and Taylor (1992) reports a positive relationship between remittances and growth in Mexico, (iii) Adams and Page (2005) finds a positive relationship between consumption and remittances in Guatemala, and (iv) Anzoategui and Demirguc-Kunt (2011), examining financial inclusion, reports a positive impact of remittances in promoting the use of deposit accounts in El Salvador. Importantly, Fajnzylber and Humberto-Lopez (2008) report the following: (i) for every percentage point increase in the remittances /GDP ratio, the fraction of the population living in poverty is reduced by an average of about 0.4%, and (ii) a one percentage point increase in remittances results in an approximately 2–3 percentage point rise in bank deposits and credit.

4.4 Remittances, consumption, and volatility

A recent study in *Global Economic Prospects* (World Bank 2015) uses an econometric model to estimate the impact of remittances on the volatility in economic growth and

consumption. The dependent variable is country-specific consumption growth and the independent variables are (i) country GDP growth and (ii) remittances/GDP ratio. A negative coefficient for the remittances/GDP ratio indicates the extent to which remittances help lower the volatility in country-specific consumption and output growth. The results show negative coefficients (of different magnitude) for all the regions studied, indicating that remittances have reduced the volatility in consumption and growth. Despite the rigor of this model, there are two possible concerns: (i) whether the measurement of GDP already includes remittances, and (ii) the possible multicollincarity between the two independent variables since both have GDP. The virtue of our methodology is that the impact of remittances on consumption and volatility is examined separately.

5 Data and distributional properties

The main sources of the data are (i) *Migration and Remittances Factbook* (World Bank 2011), Migration and Development Brief, World Bank, 2015, (ii) *International Financial Statistics Yearbook (International Monetary Fund 2015), International Debt Statistics (World Bank,* 2014). Real per capita national income (PCG I) is derived from deflating Gross National Income (GNI) by population and the GDP deflator (2005 = 100). G I is GDP less primary income from abroad, this lends to the accuracy of separating transitory income (remittances) from permanent income (PCGNI). CON is per capita household consumption expenditures deflated by the CPI (2005 = 100). REMIT is remittance flows. INT is real long term interest. PCGNI, CO and REMIT are measured in US$ millions, this avoids any possible problem associated with the impact of exchange rate changes on the values of the estimates, and also help enable us to make cross-country comparison in consumption and purchasing power. It is important to note that the value of remittances used in this study are from official sources. Many studies have documented the presence of an informal channel for remittances, these flows are not tabulated nor included in national income data. The results of this study must be interpreted in terms of the official data used.

The distributional properties of the data on Appendix Table 5, in most cases, show the absence of normality (an important assumption of data distribution in econometrics). To minimize this problem, we test for the stability of the data using two panel-based unit root tests, (i) Levin et al. (2002), and (ii) Breitung (2000). Based on the results (Appendix Table 6), the null hypothesis of the Group Unit Root Test is rejected at the first difference and second difference levels for the three categories (a) with individual intercept, (b) with trend and intercept, and (c) none.

6 Model specification

We use the panel data methodology (Baltagi 2002) with the estimation of four different model specifications: (a) Restricted, (b) Unrestricted-Fixed Effects, (c) Fixed Effects, and (d) Random Effects. We use different diagnostic tests to determine the relevant specification. The model specified relates real consumption (CON) as a function of three independent variables (i) the real interest rate (INT), (ii) Remittances (REMIT), and (iii) real per capita national income (PCGNI). Based on the theoretical PIH model, REM is the measurement of transitory income and PCGNI is the measurement of

permanent income. A positive relationship is hypothesized between CON and PCGNI, and between CON and REMIT (the consumption augmentation effect), while a negative relationship between CON and INT. A decrease in INT encourages current consumption (by borrowing) while an increase in INT motivates savings (less current con umption) a la the inter-temporal choice theory (the ability of household to substitute between current and future consumption).

6.1 Restricted model

We specify the model in double logarithmic format: (a) to minimize the impact of the extreme values (outliers) of some variables on the regression estimates, and (b) each estimated coefficient is interpreted as elasticity of the independent variable with respect to dependent variable. Eq.1 indicates the pooled constant coefficient model.

$$\ln CON_{it} = a_1 + a_2 \ln INT_{it} + a_3 \ln REMIT_{it} + a_4 \ln PCG \ I_{it} + \mu_{it}$$
$$i = 1-11; t = 2003-2013 \tag{1}$$

If the results show: (i) high t values, (ii) high R^2, (iii) the expected sign of each coefficient, and (iv) low DW statistic, then there is evidence of auto-correlation or spatial correlation. This model does not take care of heterogeneity or individual uniqueness of each country since the constant intercept coefficient (a_1) is the same for each country. Individuality is the subject of the error term; auto-correlation could be caused by heterogeneity, which is unobservable data.

6.2 Unrestricted model: LSDV fixed effects

The Least Squares Dummy Variable (LSDV) model allows for heterogeneity among countries by allowing each entity to have its own intercept value. In this model (i) intercepts are different for each entity but do not vary over time (time invariant), (ii) the slope coefficient of the regressor does not vary across countries over time. It i specified as Eq. 2.

$$\ln CON_{it} = a_{1i} + a_2 \ln INT_{it} + a_3 \ln REMIT_{it} + a_4 \ln PCG \ I_{it} + \mu_{it}$$
$$i = 1-11; t = 2003-2013 \tag{2}$$

Note that there is a subscript i on the intercept term to suggest that the intercepts of the 11 countries may be different. The difference may be due to heterogeneity caused by cultural, institutional and economic factors.

Country effect The LSDV-FE model allows for heterogeneity by estimating a different intercept for each country. The model is specified without the constant term because it is not necessary to identify a base (reference) country to make comparison. We estimate Eq. 2 with 11 dummies to represent the 11 countries.

Time effect The restricted model imposes a common intercept for the entire period, i.e. it is time- invariant. For risk and changing policy considerations/effects it is important to detect the timely (dynamic) effects of remittances on consumption over time. We estimate Eq. 2 with an intercept term and ten (2004–2013) time dummies; the intercept coefficient represents the value of the base (reference) period 2003. The dummy variable co-efficient

measures the yearly change in the intercept in the post 2003 period due to changes in remittances. The intercept differential represents the structural shifts are due to regulatory or external factors; in this case, economic recession, unemployment in the housing/ construction sector and border patrol in the USA.

We use the "one way" fixed effects model, since the "two way" model which incorporates dummies for both time and country effects lead to the problems of inadequate degree of freedom and avoid the dummy variable trap, a situation where perfect collinearity (or multicollinearity) may exist (Gujarati and Porter 2009).

6.3 The fixed effects model (FEM)

An extension of the LSDV-FE model is the FEM which is estimated without the "time" dummies and the "country' dummies. The different intercept estimates of the FE-LSDV model are captured by the intercept (constant) estimate of the FEM; it is referred to as the "average fixed effects".

6.4 The random effects model (REM)

Kmenta (1986) provides the rationale for the REM; if the dummy variables do in fact represent a lack of knowledge about the true model why not express this ignorance through the disturbance term. It is important to discuss the differences between the FEM and the REM. (a) in the FEM, each unit has its own (fixed) intercept coefficient; in the REM, the intercept values are random, thus we observe fixed individual effects and random individual effects; (b) in the REM, the error term is composite with: (i) a cross-section of individual specific error component, and (ii) a component that combines time series and cross-section error, called the idiosyncratic term because it varies over cross-section units as well as time; (c) for the REM, the assumption is that the individual error components are not correlated with each other and are not auto-correlated across both cross sections and time series unit; (d) the REM is specifically estimated using the GLS technique; (e) unlike the fixed effects estimators, the REM takes into account variation between individuals as well as variation within individuals, this makes it an attractive alternative to the fixed effects estimations; and (f) the Hausman (1998) test is used for comparing the results of the FEM and the REM regressions; the null hypothesis underlining the Hausman test is that the estimators do not differ substantially if it is rejected the conclusion is that the REM is not appropriate because the random effects are probably correlated with one or more regressors (Gujarati and Porter 2009, Ch. 16).

We thought also of using, the dynamic panel data approach by including the lagged LFPR value as an independent variable. However, there are several estimation problems associated with the dynamic panel data technique. First, there is a reduction in the degree of freedom. Second, we usually deal with unobserved heterogeneity in panel data regressions by using fixed or random effects models. In a dynamic panel data setting, these methods create a correlation between the lagged dependent variable and error term that makes the coefficient of the lagged dependent variable biased, especially when we have samples with a small time dimension like ours. The Arellano and Bond's (1991) GMM estimator is a commonly proposed solution to this problem but, as argued by Bond (2002), it

is also likely to give us biased estimations when the available instruments are weak, which is frequently the case.

7 Discussion of Results

7.1 Restricted model

We estimate the model (panel least squares) with cluster-robust standard error (White period standard errors and covariance); Carter-Hill et al. (2011) provide the justification for using this technique. The results, with t-values in parentheses, are:

$$LCO = -3.413170 + 0.733204\ LREMIT - 0.167829\ LINT + 1.011560\ LPCGNI$$

$$(-5.1217)\quad (18.8863)\quad (-2.1697)\quad (15.0718)$$

$$R^2 = 0.831845,\ DW\ stat = 1.352814\ \ F\text{-statistic} = 192.9283$$

Each coefficient represents the elasticity of the respective independent variables. The coefficients of all three independent variables LREMIT (0.733), LINT (−0.16), and LPCGNI (1.011) are statistically significant ($p < 0.10$) with the expected signs. We refrain from discussing the implications of the results until we examine the results of the LSDV-FE model.

7.2 The unrestricted model (LSDV-FE)

Country effect The results, presented on Table 1, indicate the significance of all three independent variables with the expected sign at $p < 0.01$. Also, all the country intercept (dummy variable) coefficients are positive and significant ($p < 0.01$) indicating the presence of individual (unique) heterogeneity. We examine the results of (a) the Wald Test, and (b) the F statistic test to determine whether the results of the restricted model or the unrestricted model (LSDV-FE) should be u ed.[7] Based on the value (see Table 1) of χ^2 (5238.5) and of the F-statistic (476.22), we reject the null hypothesis ($p < 0.01$) of equal intercept; thus the LSDV-FE model is appropriate.

Time effect The estimates of the LSDV-FE model are presented on Table 2. The coefficient estimates of the independent variables of the LSDV-FE time effect are slightly different from those of the country effect (Table 1); however, the coefficients have the same signs, thus the interpretation and the implications of the results are the same. The intercept coefficient (−3.854) for the base period 2003 is statistically significant, however, the other yearly dummies (annual changes in the intercept) are negative, with the coefficients for the period 2008–2013 statistically significant. Based on the Wald test, the null hypothesis of the equal intercept is not rejected.

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[7] Wald test and F test. If the intercepts are equal for all countries, then there are no fixed effect, that is no individual heterogeneity to be captured by these effects. We can test for the equality of all tests using the Wald Test. If the Null Hypothesis of equal intercepts is rejected, there are fixed effects that is individual heterogeneity can be captured by these effects.

Table 1 Regression results: Unrestricted model: LSDV-FE, country effects

Dependent variable: Ln CON
Method Panel least squares
Total panel (unbalanced) observations 121

Variable	Coefficient	t-Statistic
Ln LREMIT	0.161891	3.816105
Ln LINT	−0.099235	−3 704949
Ln LPCGNI	0 875797	8.70739
$DUM_{COLOMBIA}$	3 267934	10 05961
$DUM_{COSTARICA}$	1 413167	4.311360
$DUM_{DOMINICAN\ REPUBLIC}$	2 069431	6.346274
$DUM_{ECUADOR}$	2.098978	6.761616
$DUM_{ELSALVADOR}$	1.586239	5.202213
$DUM_{GUATEMALA}$	2.311717	7.535622
$DUM_{HONDURAS}$	1 707714	5.662951
$DUM_{JAMAICA}$	0.852340	2 681467
DUM_{MEXICO}	3.903848	11 27825
$DUM_{NICARAGUA}$	1 433979	5.386951
DUM_{PANAMA}	1 010616	3 165846
R^2	0.896117	
Adjusted R^2	0 895645	
Durbin-Watson stat	0.104957	

Wald test country effect

Test Statistic	Value	df	Probability
F-statistic	476.2297	(11, 107)	0.00000
Chi-square	5238.527	11	0 00000

7.3 The FEM and REM

The coefficient estimates, with the t-values in parentheses, of the FEM (panel least squares) and the REM (panel EGLS using Swamy and Arora estimator of component variances) are:

Fixed Effects Model

$$LCO = -3.4132 + 0.7332\ LREMIT - 0.1678\ LINT + 1.0116\ LPCGNI$$
$$(-4.2388) \quad (6.731) \quad (-1.8283) \quad (11.4912)$$
$$R^2 = 0.8318; DW\ stat = 1.3528; F-statistic = 192.9283$$

Random Effects Model

$$LCON = -11.7246 + 0.7047\ LREMIT - 0.8775\ LINT + 1.8512\ LPCGNI$$
$$(-3.4439) \quad (6.5235) \quad (-3.1298) \quad (12.2564)$$
$$R^2 = 0.983; DW\ stat = 2.34; F-statistic = 233.67$$

Applying the Hausman Test (for correlated random effects or for cross-section random effects), the value of the χ^2 statistic (182.83) with the associated ρ (0.0000), we reject the null hypothesis and accept the results of the FEM. For the REM, the random effects are probably correlated with one or more regressors, (right hand side variables), a case of endogeneity. The signs and the significance of coefficients of the FEM are not significantly different from those of the other models.

Table 2 Regression results of the unrestricted model: LSDV-FE time effects

Dependent Variable: Ln CON
Method Panel least squares

Variable		Coefficient	t-Statistic
Constant		−3 854678	−4 706305
Ln LREMIT		0.148837	17.18245
Ln LINT		−0 134014	−2 439073
Ln LPCGNI		0.713657	12 16898
DUM_{2004}		−0 112222	−0 484728
DUM_{2005}		−0 288681	−1 241927
DUM_{2006}		−0.321605	−1.381456
DUM_{2007}		−0.379385	−1.622455
DUM_{2008}		−0.561183	−2 366707
DUM_{2009}		−0 484287	−2 052264
DUM_{2010}		−0.539483	−2 250398
DUM_{2011}		−0 583238	−2.391570
DUM_{2012}		−0.605654	−2 477089
DUM_{2013}		−0 643758	−2.627377
R^2		0 850496	
Adjusted R^2		0.832332	
Durbin-Watson stat		1 215657	
F-statistic		46 82303	
Wald Test Time effect			
Test Statistic	Value	df	Probability
F-statistic	1.334873	(10, 107)	0 2214
Chi-square	13.34873	10	0 2048

7.4 The relevant model and discussion of the results

Based on the diagnostic tests, the results of the FEM and LSDV-FE (country effect) models are considered relevant. The signs, values, and level of significance of the coefficients are very similar. We discuss the results of the LSDV model, presented on Table 1, since the significant dummy variable coefficients add further information regarding heterogeneity. All the coefficients are statistical significant at the 95% level with the hypothesized signs. The coefficient estimate (−0.099) indicates a low response in consumption (CON) to changes in of real interest rate (INT) or the ability of households to make inter-temporal choice between present and future consumption through borrowing/saving. This phenomenon is common in countries with undeveloped financial and capital markets and relatively inefficient financial institutions. The coefficient estimate (0.8757) indicates a high per capita real national income (PCGNI) elasticity of consumption; this is supportive of the high consumption/GDP ratio reported on Table 3. The coefficient estimate (0.1618) attests to the importance of remittances (REMIT) on consumption with an elasticity of 0.17 (17%), this is also supported by the high remittances/GDP ratio reported on Table 3; these ratios range from 1.23% to 19.23%. The value of the remittance coefficient also indicates that a large part of remittances is saved; this finding partially supports the view that all of transitory income should be saved rather than spent on current consumption. UNCTAD (2010) reports a saving rate of 70% on remittances for countries in Asia and Africa. Households in countries with high level of poverty use remittances to smooth volatility in consumption as well as for savings/investment.

The coefficient of per capita real national income (0.8757) is higher than that of remittances (0.1618), indicating that consumption responds more strongly to permanent income than to transitory income; similar to Hall and Mishkin (1982). Their findings, like

ours, also do not support the PIH that transitory income does not impact consumption. The consumption smoothing effect of remittances is also indicated by the higher variability (standard deviation) in consumption (1.323) than in remittances (1.1768). The low correlation between remittances and per capita real national income (0.2184) indicates the counter cyclical impact of remittances i.e. remittances increases when per capita real national income decreases (in the recipient countries), this finding supports the altruistic motive for remittances.

The value of the dummy variables (slope intercept) for each country is positive and statistically significant indicating that there is significant heterogeneity among the countrie . The values range from 0.85 (Jamaica) to 3.9 (Mexico). The heterogeneity is attributed to differences in social and economic institutions, culture and attitude towards consumption, savings, and work. Several studies, using country specific micro-data (obtained from field study and survey techniques), identify many differences in social-economic characteristics that determine the use of remittances; for example, Adams (2006) notes that differences in social-economic behavior affect the propensity to consume, save and invest.

There are two important ramifications of the results. First, our results find a positive impact of remittances on consumption and also a stabilizing effect of remittances; they are different from Neagu and Schiff (2009) who find that remittance flows are pro-cyclical and have a destabilizing effect. Second, whether the positive contribution of remittances to consumption adds to the volatility of consumption in the LAC region (ECLAC 2014); we find a remittance (transitory income) elasticity of 0.167, but a higher real national income (permanent income) elasticity of 0.875. Based on these findings, we don't believe that remittances contribute to the volatility in consumption. Some policy makers are more concern about the negative effects of consumption volatility generated by increase in national income in the region rather than by remittance flows.

8 Conclusion

Based on the PIH, this study adds the literature on the impact of remittance flows on consumption behavior. The results indicate the significance of remittances (transitory income) as well as permanent income in selected LAC countries. The consumption augmentation and stabilization effects of remittances could contribute to savings, capital formation and investment in real and financial assets which could have a multiplier growth effect. The policy ramifications are: (a) global coordination to increase and stabilize the flow of remittances, and (b) institutional and financial reforms to enable the leveraging of remittances to enhance economic and social development (Ratha 2007). Policy makers in the region have to deal with many risk factors since about 75% of the flows to LAC countries originate from the USA; for example, (a) the Consumer Financial Protection Bureau (2011) rule which is designed to standardize the remittances industry as well as to promote transparency and disclosure in exchange rate and transfer cost, (b) the current immigration policy under the Trump administration could discourage emigration to the USA particularly from LAC countries, and (c) besides a decrease in consumption, other consequences of decreasing remittances include a loss in domestic banks' earnings from foreign exchange operations and the possible decline in credit to households and small firms.

Much of the studies on this topic use aggregate data. The availability of country specific micro-data on the uses of remittances could stimulate more elaborate studies. The minor

limitation of this study is the unavailability of the most recently published data on other countries of the region with high remittances/GDP ratio (for example, Guyana and Haiti).

Appendix

Table 3 Important ratios (2003–2013)

	Con/GDP		Remit/GDP		Remit/Pop		GDP Pop	
Countries	Mean	St Dev	Mean	St.Dev	Mean	St Dev	Mean	St Dev
Colombia	64 04%	0 0242	1.90%	0 54%	$87 6535	$10 1978	10,482.8	2727 4
Costa Rica	66.14%	0.0105	1 88%	0 48%	$110 2109	$20 3729	3,345.603 3	1,155.694 1
Dom Rep	81 73%	0 0480	8 24%	0 60%	$345 9521	$62.5982	157,060 2	57.373.5
Ecuador	64.37%	0 0345	4 78%	1 42%	$184 2519	$38 2732	3886 4	1264 5
El Salvador	93.34%	0 0256	17.70%	1.69%	$546 3795	$87.3441	3261.5	460 0
Guatemala	86.65%	0.0130	11 08%	1 02%	$284.4449	$53 1965	20,771 3	4447.1
Hondras	77.90%	0.0264	19 32%	1.74%	$312 5964	$85.9471	34,392 3	8457.2
Jamaica	81.32%	0 0487	16 62%	1.16%	$671 9336	$159.7811	334,823 2	117,085.3
Mexico	66.07%	0.0124	2 40%	0.32%	$207.0754	$28.5274	105.2	18.7
Nicaragua	81.84%	0.2432	9 73%	0.75%	$135.3063	$30.3889	33,024.9	29,423 6
Panama	56.96%	0.0546	1 23%	0.31%	$86 4108	$33.0299	7041.5	2512.7

Con/GDP = Consumption/GDP; Remit/GDP = Remittance/GDP; Remit/Pop = Remittance/Population. (in US $) GDP/Pop = per capita GDP in local currency except for Colombia and Mexico, which is in thousands of local currency

Sources: International Financial Statistics Year book (IMF 2012 and 2016), International Debt Statistics (World Bank 2014), Migration and Remittances Factbook (World Bank 2011)

Table 4 Outlook for remittance flows to developing countries, 2008–2015

	2008	2009	2010	2011	2012	2013	2014f	2015f
$ billions								
All developing countries	324	307	325	351	403	418	430	432
East Asia and Pacific	85	85	94	101	107	113	122	127
Europe and Central Asia	45	36	36	40	46	52	44	34
Latin America and Caribbean	64	57	57	61	60	61	64	67
Middle-East and North Africa	36	34	35	36	49	49	51	50
South Asia	72	75	82	90	108	111	116	118
Sub-Saharan Africa	22	20	21	23	32	32	35	35
World	456	429	449	483	533	557	592	582
Low-income countries	22	23	25	28	31	33	35	35
Middle income	302	284	301	324	372	385	401	405
High income	132	123	124	132	130	139	147.3	145.8
Growth rate%								
All developing countries	16.4	5.2		8	6.1	3.7	3.2	0.4
East Asia and Pacific	18.8	0.4	10 2	7.6	0.1	5.5	7.4	4 2
Europe and Central Asia	16 3	19.8	−0.1	11	9 6	11 1	−9.0	−20.3
Latin America and Caribbean	2 2	12.2	1 2	7	11	1.2	4 0	4 8
Middle-East and North Africa	12	−6.7	3.3	2.6	16	0	4.0	−0 9
South Asia	32.6	4 8	9.5	10.1	11.2	2.5	4.3	2.0
Sub-Saharan Africa	15.8	−7	4.5	7.1	1.6	0.9	0.2	1.0

Table 4 (continued)

	2008	2009	2010	2011	2012	2013	2014f	2015f
World	**15.9**	**−5.8**	**4.6**	**7.5**	**4.1**	**4.5**	**3.3**	**−1.7**
Low-income countries	32 8	3.7	8.9	12	12.5	4.4	6.2	1.4
Middle income	15 4	−5.9	5.8	7.6	5 6	3.6	4 2	0.9
High income	14.7	−7.1	1.1	6.3	−1.7	7.1	5 7	−1

The bold entries indicate the total amount for the specific region

f = forecast

Sources

1. *Migration and* Development Brief # *17*, by Ratha et al. (2011)
2. *Migration and* Development Brief # *24*, by Ratha et al. (April 2015)

Table 5 Statistical properties of data (2003–2013)

Countries	Stat Dist	Remit (US $ Mil.)	Pop (Mil.)	Consumption	GDP	GNI in $	Interest Rate
Colombia	Mean	3956.73	45.05	302,765.55	477,656 64	230,332 14	13.41
	St Dev	552.48	2 21	82,636 64	146,318 30	88.548 31	2.31
	Kurtosis	−0 65	−1 25	−1.18	−1.13	−1 29	−0.58
Costa Rica	Mean	501 64	4 53	10,141,019 55	15,390,836 55	29,100 36	19.17
	St Dev	105 30	0.23	3,830,875 45	5,997,158.13	11,636 43	4 25
	Kurtosis	−0.27	−1.15	−1.26	−1.22	−1.03	−1.28
Dominican	Mean	3444 82	9.90	1,283,293.73	1,573,932 27	42,471.18	19 88
Republic	St Dev	737.21	0.39	486,940.99	623,341.44	11,495 01	6.83
	Kurtosis	−1 23	−1 14	−1.31	−1 00	−1.31	0.07
Ecuador	Mean	2568.45	13.99	35,205 09	55,581.18	58,297.23	11.59
	St.Dev	498.34	1.13	12,674 66	22,516.68	20,307.49	2 50
	Kurtosis	0 27	−1 62	−1.02	−0.77	−0 98	−2.46
Elsalvador	Mean	3369 91	6.16	18,813.18	20,121.17	19,907.95	7.02
	St.Dev	576.31	0.11	3154.51	3160.86	2952 25	1 13
	Kurtosis	0 94	−1.14	−0 97	−1.07	0.29	0.06
Guatemala	Mean	3948.18	13.72	250,864.00	289,430.27	36,214.00	13.50
	St.Dev	989 22	1 11	72,912 77	84.313.70	10,176.41	0 61
	Kurtosis	−0.37	−1 15	−1.17	−1.23	−1 03	3.12
Honduras	Mean	2323.73	7.34	201,004.64	256,066.18	12,203.18	18.81
	St.Dev	727 60	0.49	66,668 82	78,989.49	4258 26	1.22
	Kurtosis	0 23	−1 19	−1.04	−1 14	−0.56	−0.21
Jamaica	Mean	1941.00	3.16	806,734 55	979,718 09	11.807.32	17.98
	St Dev	254 11	1.52	275,049.21	295,138 49	2177.21	1 20
	Kurtosis	0 52	10.97	−1.32	−1 29	−0.07	0.43
Mexico	Mean	23,018.09	111.39	7826 00	11,831.17	975,455.45	6.75
	St Dev	3000.64	7.22	1927.57	2805.36	177,826 03	1 74
	Kurtosis	0.90	−1.63	−0.77	−0.99	−0.54	−0.90
Nicaragua	Mean	767.09	5.64	119,148 28	185,250.90	7819 45	13 07
	St.Dev	196 41	0.31	57,107.41	157,589.24	1701.83	1 47
	Kurtosis	−0.48	0.40	0.05	6.60	−1.03	−0.27
Panama	Mean	305.27	3.46	13,911.79	24,971.96	24,614.45	8.06
	St Dev	12843	0 26	5410 27	10,809.75	10,339.80	0.98
	Kurtosis	−0 98	−1 51	−1 06	−0.65	−0 98	0 04

Remit = Remittances in millions US $. **Pop** = Population in millions. **Consumption** = Consumption in millions of local currency, except for Colombia and Mexico, where it is in billions of local currency. **GDP** = Gross Domestic Product in millions of local currency except for Mexico and Colombia where it is in billions of local currency. **GNI in $** = Gross National Income in millions of US dollars. **Interest Rate** is the deposit rate

Sources: International Financial Statistics Year book (IMF 2012 and 2016), International Debt Statistics (World Bank 2014), Migration and Remittances Factbook (World Bank 2011)

Table 6 Group Unit Root Test: Sample: 1121: Series: LCON, LINT, LREMIT, LPCGNI

Level (a) with individual intercept	Method	Statistic	Prob	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−1.61764	0.0529	480
	Breitung t-stat	−4.40351	0.0000	476
Level (b) with trend and intercept	Method	Statistic	Prob.	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−1.39294	0.0818	480
	Breitung t-stat	−0.17635	0.4300	476
Level (c) none	Method	Statistic	Prob.	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−0.63727	0.2620	480
	Breitung t-stat	−1.05649	0.1454	476
1st Diff(a) with individual intercept	Method	Statistic	Prob	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−25.8214	0.0000	476
	Breitung t-stat	−19.7146	0.0000	472
1st Diff (b) with trend and intercept	Method	Statistic	Prob.	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−28.947	0.0000	476
	Breitung t-stat	−18.8754	0.0000	472
1st Difference (c) none	Method	Statistic	Prob.	Obs
	Null. Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−22.0583	0.0000	476
	Breitung t-stat	−21.2469	0.0000	472
2nd Diff (a) with individual intercept	Method	Statistic	Prob.	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−10.7537	0.0000	455
	Breitung t-stat	−16.1546	0.0000	451
2nd Diff (b) with trend and intercept	Method	Statistic	Prob.	Obs
	Null: Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−10.8965	0.0000	455
	Breitung t-stat	−16.308	0.0000	451
2nd Diff (c) none	Method	Statistic	Prob.	Obs
	Null. Unit root (assumes common unit root)			
	Levin, Lin & Chu t	−17.6009	0.0000	455
	Breitung t-stat	−16.6025	0.0000	451

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