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Article

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How important are remittances to savings? Evidence from the Latin America and the Caribbean Countries

Abstract

This paper investigates the direct and the indirect roles of migrant transfers in the saving behaviors of the Latin America and Caribbean (LAC) countries during the period 1997–2018. Using the autoregressive distributed lag (ARDL) panel estimation technique, the results based on the Pooled Mean Group approach provide strong evidence of the importance of inward remittances to savings. On average, an increase in inward remittances by 1% leads to about 0.10% increase in savings *ceteris paribus*, but the effect is quantitatively larger in the short-run than in the long-run, albeit more significant in the latter case. Quite outstanding here is the observation of the detrimental role of remittances on savings in the long-run once governance quality in aggregate and disaggregated forms are controlled for, suggesting possible adverse effects of remittances for economic development in the long-run. Nevertheless, macroeconomic stability as well as institutional quality, foreign direct investment (FDI), and foreign aid were found to be important moderators of the remittances–savings linkage. For the latter two variables, emphasis is on complementarity rather than substitutability between remittances, aid, and FDI. While in the short-run remittances appear to perform better in enhancing savings in countries where an improvement in corruption control is visible, political rights and civil liberties compliment migrant transfers in propelling savings in the long- and short-runs, respectively. Moreover, remittances are found to play a major role in ameliorating the adverse effects of the financial crisis on savings, just as they are observed to function as a lifeline to savings in countries with increasing macroeconomic instability in form of inflation, in the long-run. The findings are robust to the use of alternative estimation techniques. Policy recommendations are suggested.

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1 Introduction

Savings play a central role in sustainable growth of economies. The economic rationale for this assertion hinges on their capacity to provide funds required for investment, which eventually translates into capital formation, employment, and growth in the per capita gross domestic product (GDP). Seminal works by Keynes (1936); Friedman (1957); Ando and Modigliani (1963); and Duesenberry (1959), inter alia, underscore the importance of savings and develop interesting theories that link savings to other economic variables such as consumption, interest rates, and income among others. Similarly, recent works by Lucas (1988) and Romer (1986) continue the discussion by relating the accumulation of savings to economic development as well as productivity. In essence, savings rates are strongly assumed as a basis for future economic growth and development, since they play the much-needed role of supporting the world's poorest to better manage risks, step out of the poverty trap, and build a better life. Robinson (2018) observed that savings are critical for poor people's consumption smoothing, risk management, and financing of important life goals such as education and starting a business. Therefore, a low savings rate would raise serious concern for policy makers as it can imply low levels of investment, less job creation, and therefore, a lower standard of living (Gani, 2016). The key question from the foregoing analysis is: what drives savings?

The aforementioned question is not new and has certainly received much attention in recent literature, especially on account of the theoretical importance of savings to sustainable development, which is something that countries generally clamor for. Essentially, a recent decline in the savings rates as well as the widening savings–investment gap visible in both developed and developing countries has attracted serious concern and rekindled the interest of economists and researchers alike to re-examine the drivers of savings, particularly in developing countries, during the last decades (Athukorala and Sen, 2004; Baldé 2011). Nevertheless, as argued in a recent paper by Hamdar and Nouayhid (2017), the on-going debate on what catalyzes savings remains inconclusive until the present day. We concur with Deaton (1989) that there are many good reasons which indicate that factors that determine saving behavior in developing countries are likely to differ from those of developed economies. Intuitively, not all developing country regions share the same saving characteristics. Heterogeneity among countries and regions could therefore explain the divergent findings in the existing literature with regard to the drivers of savings.

In this paper, we focus on developing countries, particularly the LAC countries, to examine the saving impact of remittances. It is noted that migrant workers support their families in home countries through remittances, which boost household income and standard of living. On the supply side, Nnyanzi (2016) argues for both altruism (or risk-sharing) and self-interest (or the investment/savings) motives as coexisting in the remittance dynamics. And, in line with Grabel (1996), it is reasonable to argue that on the demand side, once the basic needs are met, migrant households could use the remainder of the received income for savings, in addition to debt repayment; purchase of consumer durables, land, and housing; small enterprise development and agriculture; and investments in education and healthcare. As remittances inflows increase in volume, a sizable amount is likely to be saved for future investment and development, since a stable flow of the same offers households an opportunity to reduce their vulnerability over time and to build assets. In theory, therefore, we would expect an increase in

remittances to be followed by an increase in savings, thereby reducing the savings–investment gap characterizing developing countries.

LAC is an interesting region for the study since the region is trapped in a vicious cycle of low savings while at the same time experiencing increasing inflows of remittances (Tables 1 and 2). For example, in relation to other developing regions, viz., East Asia and Pacific (EAP), and South Asia, the LAC region appears to have the lowest savings rate, which, on average, has been trending downward for the last few decades. According to Cavallo and Serebrisky (2016), for example, LAC countries save less than 20% of their national income in relation to the high-growth countries in East Asia that save about 35% of national income. The authors observe further that LAC saves less than every other region in the world, except Sub-Saharan Africa (SSA). In support of the latter argument, Table 1 reveals that while, say, in 1985 South Asia had a savings-to-GDP ratio of 18%, lower than that of the LAC region that stood by then at 20.4%, this had by 1997 risen to 26.3% for South Asia but dropped to 17.6% in the LAC countries. Ten years later, the savings-to-GDP ratio had risen to about 31% for the South Asia region compared to a further fall to 17% in the LAC region. Likewise, the Middle East and North Africa (MENA) region performed far better that the LAC region, having progressed from a lower savings-to-GDP ratio (gross domestic savings) of 19.1% compared to the LAC region with 24.8% contribution to GDP, to an increase of 29.5% of GDP in 1997 (compared to a reduction to 19.7% in the LAC region), and then to about 32.3% in 2018 in relation to 18.7% for the LAC countries, which was a reduction from its initial levels. Overall, in terms of GDP, the LAC region saves 10%–15% less than the most dynamic countries of emerging Asia. We consider this a policy challenge that requires a deeper analysis into what drives savings.

Several studies have over time analyzed the low saving rate puzzle persistent in the LAC region (e.g., Loayza et al., 2000; Grigoli et al., 2015; Cavallo and Serebrisky 2016), with the latter

Table 1 Savings and remittances (% of GDP) for selected developing regions

	East Asia & Pacific			South Asia			Latin America & Caribbean			Middle East & North Africa			SSA		
	GDS	GS	REM	GDS	GS	REM	GDS	GS	REM	GDS	GS	REM	GDS	GS	REM
1985	32.8	–	–	15	18	1.99	23.7	19.2	0.39	19.1	–	–	27.7	26.2	0.69
1986	33.2	–	–	14.6	16.9	1.81	21.2	17.0	0.44	15.2	–	–	28.8	27.2	0.68
1995	34.8	–	0.19	23.7	25.9	2.1	19.4	17.1	0.74	27.6	25.8	–	23.0	22.5	0.96
1996	34.4	34	0.22	23.3	25.8	2.36	19.5	16.9	0.68	29.9	27.0	–	21.9	21.1	0.85
1997	34.5	34.4	0.29	23.1	26.3	2.66	19.7	17.6	0.66	29.5	26.4	–	21.8	21.9	1.08
2005	34.6	35.2	0.37	28.9	33.2	3.28	22.6	20.3	1.81	41.0	39.5	1.95	23.7	22.9	2.91
2006	35.4	36.4	0.39	30.1	34.5	3.57	23.2	21.0	1.91	41.8	40.8	1.82	26.8	27.0	2.86
2007	36.3	37.5	0.42	30.4	35.1	3.62	23.1	22.2	1.73	41.5	40.7	1.92	22.5	21.5	2.74
2010	36.1	36.9	0.42	30.3	34.6	3.98	22.1	20.6	1.1	40.4	–	1.67	22.4	20.8	2.4
2015	34.4	35.4	0.58	27.5	31.8	4.36	18.4	17.2	1.4	31.2	–	1.94	18.2	17.7	2.59
2016	34.2	35.0	0.53	27.3	31	3.79	18.4	16.9	1.5	30.5	–	1.91	18.1	17.4	2.48
2017	34.8	35.8	0.49	27	30.3	3.5	18.5	17.5	1.5	31.6	–	2.09	19.0	18.3	2.54
2018	34.6	35.5	0.46	26.4	29.9	3.82	18.7	17.6	1.7	32.3	–	2.2	18.2	17.6	2.84

Source: World Bank (2019): GDS, gross domestic savings; GDP, gross domestic product; GS, gross savings; REM, remittance inflows; SSA, Sub-Saharan Africa.

Table 2 Remittance inflows to low- and middle-income regions

	2010	2016	2017	2018
	(US$ billions)			
Low and middle income	**343**	**444**	**484**	**526**
EAP	96	128	134	143
Europe and Central Asia	38	44	53	58
Latin America and the Caribbean	56	73	81	88
MENA	39	51	57	58
South Asia	82	111	117	132
SSA	32	38	42	47
World	**470**	**589**	**634**	**683**
	Growth rate (%)			
Low and middle income	**11.6**	**–1.6**	**9.1**	**8.6**
EAP	19.9	–0.5	5.1	6.8
Europe and Central Asia	5.6	0.1	22.3	8.4
Latin America and the Caribbean	2.5	7.4	10.8	9.6
MENA	18.2	–1.2	12.1	1.6
South Asia	9.4	–5.9	5.8	12.7
SSA	11.1	–9.9	9.4	10.7
World	**8.6**	**–1.1**	**7.7**	**7.6**
	(% of GDP)			
Low and middle income	**1.5**	**1.6**	**1.6**	**1.6**
EAP	0.4	0.5	0.5	0.5
Europe and Central Asia	0.6	0.8	0.8	0.8
Latin America and the Caribbean	1.1	1.5	1.5	1.7
MENA	1.7	1.9	2.1	2.2
South Asia	4	3.8	3.5	3.8
SSA	2.4	2.5	2.5	2.8
World	**0.6**	**0.7**	**0.7**	**0.8**

Source: World Bank (2019).

EAP, East Asia and Pacific; GDP, gross domestic product; MENA, Middle East and North Africa; SSA, Sub-Saharan Africa.

particularly arguing that the challenge of a low savings rate, together with the inefficient intermediation of the little savings generated, is exacerbated by the inefficient financial system. In a region where other forms of foreign capital, particularly foreign direct investment (FDI) and foreign aid (AID), are dwindling, increasing inward remittances (see Tables 1 and 2) as an alternative source of foreign capital can constitute an important part of private savings. Certainly remittances may not substitute other sources of finance, since they are not a panacea to development issues (Keller, et al., 2018), but could instead play a complimentary role. The argument here is that the importance of remittances to home countries cannot be underestimated, especially in countries with less developed financial systems and credit-stricken households. For, it is in such an environment, as Giuliano and Ruiz-Arranz (2009) argue, that diaspora transfers could boost growth by providing an alternative source of financing investment, improving

welfare of recipients, and easing liquidity constraint. In contrast, depending on the recipient households, remittances could be used for purposes other than savings to achieve these benefits. For, as noted earlier, the incentives for sending of remittances are not limited to self-interest or savings but also to altruism, solidarity, and debt payment as well as diversification of household income (Nnyanzi, 2016).

We note with curiosity that the aforementioned merits of both remittances and savings notwithstanding, a detailed review of the existing documentation reveals a relatively limited number of studies investigating migrants' remittances and savings jointly. Nonetheless, a few available papers report mixed findings. In one strand of literature, for example, a negative remittance effect on savings is visibly traceable, such as in, inter alia, Athukorala and Sen (2004) for India; Sahoo and Dash (2013) for five Asian countries; Hossain (2014) for 63 developing countries during the period 1971–2010; Caceres and Saca (2006) for El Salvador; Morton et al. (2010) for top 20 remittances recipient countries for 2008; and Hamdar and Nouayhid (2017) in Lebanon. On the other hand, the positive influence of migrant remittances on domestic savings is reported elsewhere in Connell and Conway (2000), Baldé (2011) for 37 SSA countries, and Gani (2016) for the Asian economies, among others. Recent work by Akter (2018), however, finds no noticeable remittance effect on savings. Support for the latter can also be found in Zhu et al. (2012) for rural China. These divergences could stem from the different methodological errors and measurement and sample characteristics. Issues of endogeneity have equally received less attention in the existing analyses, which in turn affects the results. We also take interest in the proxies utilized for savings. While domestic savings appears to characterize the majority of the studies as the dependent variable, other studies adopt GS instead. Note should also be made here that country-specific as well as cross-sectional studies appear in the empirical analyses, a fact that could further explain the mixture in findings. According to Sauvant and Sachs (2009), differing sample sizes and short time series might explain the divergent findings.

In order to circumvent the aforementioned challenges, we utilize panel data, well-known for its attractive informational advantages over time-series and cross-sectional studies. For example, panel data permits use of both time-series and cross-sectional variation, thereby providing a substantially superior identification and separation of the various economic mechanisms underlying savings behavior that are often confounded in the snapshot analysis of cross-sectional data and by aggregation in time-series analysis (Börsch-Supan, 1990). Moreover, panel data allows the user to control for some types of omitted variables without observing them. Additionally, panel data offers a more heightened capacity for modeling the complexity of saving behavior than a single cross-section or time-series data can possibly allow (Hsiao, 2007). The autoregressive distributed lag (ARDL) approach that takes care of endogeneity and heterogeneity issues as well as its ability to dissect between long-run and short-run results is the selected study model in the current analysis. We focus on the LAC region in the current analysis given its position as a major migrant transfer recipient in the developing world. A glance at Table 1 reveals that apart from SSA with a percentage increase of 162.9% in remittance inflows between 2 years, 1997 and 2018, the LAC region has the highest percentage increase of 157.6%, followed by East Asia and the Pacific with 58.6% and South Asia whose remittance inflows grew by 43.6% during the same period. Table 2 reemphasizes this performance by making comparisons at a wider scale.

The evidence provided shows that remittance inflows to the region grew from as low as 2.5% in 2010 to 9.6% in 2018, which represents an increase of almost 284% between these years. In terms of GDP, we observe an increase in the GDP contribution of 1.1% in 2010 to 1.7% in 2018, suggesting an increase of almost 54.5% in growth, which is far beyond any other region's change in GDP contribution growth: 33.3% for Europe and Central Asia; 29.4% for MENA; 16.7% for SSA; and a reduction of 5% for South Asia.

Particularly notable in Table 2 is that remittances flow into LAC grew about 9.6% to $88 billion in 2018. At a country level, documented statistics (World Bank, 2019) reveal that a country like Mexico continued to receive the most remittances in the region, posting about $36 billion in 2018, up 11% over the previous year. In 2013, the country had the fourth-highest volume of remittance flows in the world, at US$21.5 billion, trailing only India, China, and the Philippines. And by 2019, the figure had risen to US$38.5 billion, leading to the third-highest position, only trailing India with US$83.1 billion, and China with US$68.4 billion (World Bank, 2020). Similarly, Colombia and Ecuador, both having most of their migrants in Spain, posted 16% and 8% growth, respectively, in 2018. Also, on their part, Guatemala, Dominican Republic, and Honduras, respectively, posted double-digit growth of 13%, 10%, and 10%, that were mainly sourced from their migrants in the United States. Further statistical evidence reveals that in the Dominican Republic, Haiti, and Nicaragua, one in every four adults receives remittances, just as it is reported that in Honduras, Paraguay, El Salvador, Guatemala, Bolivia, and Colombia, over 10% of adults receive these transfers from migrants abroad (Pugliese and Ray, 2011; Burgess, 2014).

Remarkably, already by 2013, for more than half of the countries in Latin America and the Caribbean, inward remittances were equivalent to over 5% of their GDP, whereas in Haiti, Guyana, Honduras, El Salvador, Nicaragua, Jamaica, and Guatemala, the remittance volume took over 10% of their GDP (Maldonado and Hayem, 2014). The explosion of remittance contribution to GDP in these and many other LAC countries is attributed to policies directed toward the promotion of remittance inflows to their countries. One good example includes, inter alia, an offer of incentives to attract migrant transfers into local savings and investment funds (World Bank, 2019). Consequently, millions of households in the LAC region receive remittances albeit for various purposes including but not limited to covering basic needs, education and health expenditures, and investment in housing and other durable goods, as well as for business creation and savings (Burgess, 2014; Keller et al., 2018).

It is important to emphasize here that while remittance inflows to the LAC region have exhibited a unique performance, the savings contribution to GDP is on the downward trend. Yet, as an important source of income, it could be argued that remittances act as an alternative savings mechanism for migrants back home, though counterarguments do likewise exist as we show shortly, at least in theory. Bauer and Sinning (2005) already purport that a sizeable part of the transfers consists of savings-related remittances of temporary migrants in Germany. By implication, the likelihood of remittance contribution to savings isn't a farfetched expectation. In the present context, the paradox of the increase in remittances inflows to the LAC region, being accompanied by sharp decline in domestic saving rate, also previously observed by Caceres and Saca (2006), requires further scrutiny. While other forms of foreign capital, particularly foreign aid, and FDI, appear to have a wider coverage in the existing literature, there are limited studies especially before the 2000s regarding the impact of remittances on any

macroeconomic variable, perhaps due to the relatively low GDP share of remittances inflows to developing regions in general. Since 2018 this has changed, when remittances became the largest source of foreign exchange earnings in the low- and middle-income countries (LMICs) excluding China. To be more specific, in 2018, remittances inflows to developing countries were more than thrice the size of official development assistance (ODA). Yet, FDI has equally been on a downward trend in recent years, making it possible for remittances to reach close to the level of FDI flows in 2018. In fact, statistics reveal that excluding China, remittances were significantly larger than FDI flows (World Bank, 2019). As theory would have it, huge amount of remittance inflows or foreign capital in general would aggravate balance of payments difficulties. Economic theory further concurs that under some conditions a reduction in foreign capital might lead to an increase in the domestic savings ratio and a rise in the incremental output-capital ratio (Griffin, 1978). Therefore, in theory, one ought to expect foreign capital inflow to reduce domestic savings. As to whether this happens to be the case in practice, and specifically for remittance inflows, is an empirical question. The patterns of inward remittances and savings depicted in Tables 1 and 2 raise the intriguing question of whether remittances are really important for savings in the LAC region.

The current paper aims at providing empirical evidence on the relative importance of the determinants of savings, paying particular attention to remittance inflows. In the analysis, we additionally incorporate the remittance interaction effect of institutional quality on savings. Ideally, a country experiencing poor institutional quality would likely suffer from a reduction in foreign capital, remittances inclusive. If the latter drastically drop, then it is likely that savings of the households would similarly be affected. In fact, Dunning (2002) argues that institutional factors such as good governance are becoming increasingly important determinants of foreign capital. Yet on the other hand, some studies (e.g., Bellos and Subasat, 2012a, 2012b) appear to suggest that that poor governance is a source of attraction rather than a hurdle for FDI in selected transition countries. By implication and in the context of the current study, the hypothesis that inward remittances are less important as a driver of savings if the institutional environment is not considered, is worth an exploration. For the LAC countries in particular, data on WGI show that in comparison to 1998, the region improved their scores considerably on political stability (PS), government effectiveness (GE), and control of corruption (CC), but made a significant drawback in regulatory quality (RQ) in 2011. By 2019, out of the 195 countries rated in terms of WGI, only three Latin American countries, viz., Chile, Uruguay, and Costa Rica, ranked in the top 60, whereas 13 out of the 35 countries in the region ranked among the lowest 50 countries in the world. According to Matera and Despradel (2020), the region has the worst levels of corruption in the world. This assertion is corroborated by data from Transparency International's Corruption Perceptions Index, where it is reported that countries in Latin America and the Caribbean have an average ranking of 36 compared to a score of 32 for SSA countries, where a score of 0 means "very corrupt" and 100 is "very clean". Additionally, GE is low in most of these countries, and almost all countries show a low level of rule of law (RL).

Still, on other aspects of institutional quality, during the period under review, the region similarly witnessed a steady decline in the political rights (PR) and civil liberties (CL), as presented in the Freedom in the World (FIW) report of 2019 (Freedom House, 2019). Specifically, for 2019, apart from Antigua and Barbuda, Argentina and Ecuador, all other countries

witnessed a significant deterioration in their freedom score relative to those that saw improvement. We contend that the institutional environment is crucial for the remittance role on savings. Several other remittance interaction effects of foreign capital, financial development (FD), and macroeconomic instability are also analyzed in the study for a simple justification that the environment is likely to play a key role in influencing the contribution of remittance inflows to savings.

Our contribution to the existing literature falls under several aspects. First, we generate empirical evidence on the determinants of savings by examining macro-level data focusing on the LAC region where the paradox of the coexistence of increasing remittances together with dwindling saving rate appears visible but less attended to in the existing literature. The question of whether remittances stimulate savings in the LAC region is still empirical. While a major part of the available scholarly works concentrates on the macroeconomic variables originally suggested in the traditional savings models, we augment these models to incorporate inward remittances as an explanatory variable in addition to others identified in literature. Second, besides the macroeconomic environment, the study takes into consideration the issue of institutional quality as moderating factors in the remittance–savings relationship, if any. The analysis of the complementarity or substitutability of inward remittances and the different sets of the environmental factors in the savings behavior of LAC countries are considered novel in the present study. We concur with Bjuggren et al. (2010) that while in the presence of poor institutional quality, remittances could play a substitutive role as a source of funding for investment, particularly where it is the only external capital available to entrepreneurs, its complementary role is not inadmissible. Specifically, institutional quality or even economic freedom could act as a disincentive to save, particularly where they are deemed poor, or remittance recipients are more likely to find a sound institutional environment as well as economic freedom that is more incentivizing for investment. We apply similar reasoning to savings in line with Giuliano and Ruiz-Arranz (2009), who argue that remittances, like foreign aid, may only be more effective in a good policy environment such as a good investment climate with sound institutions. The availability of data on the selected moderating variables allows an explicit evaluation of their direct effect on savings but also the indirect effect of remittances via these interventions. Intuitively, an interactive savings model is applied to account for the possibility of conditional effects.

Likewise, we test for the moderating effect of macroeconomic instability on the inward remittance–savings relationship, if any. A similar interactive model approach is adopted in Bjuggren et al. (2010) albeit for an analysis of the investment drivers instead in 79 developing countries during 1995–2005. In any case, the authors, interestingly, note that the marginal importance of remittances as a financial source for investment decreases with improved institutional framework. Motivated by these findings, we evaluate the saving behavior as remittances change in the face of a dynamic environment. Additionally, we include alternative forms of foreign capital as conditional factors in the remittance–savings model. Third, we differentiate between the remittance impact on national or public savings, here known as GS. Finally, we incorporate the financial crisis (FC) dummy to capture the effect of external shocks that appear common during the global FC of 2007 onward. With the majority of the migrants located in severely hit countries such as the USA, Spain, and other advanced countries, inward remittances could have been equally affected and in turn affected their possible impact on savings.

Finding out the extent to which the crisis would have moderated the remittance–savings nexus in the LAC region is considered critical.

The empirical findings reveal that inward remittances are crucially important for savings in the LAC countries. Evidence also points to the complementarity role of foreign capital proxied by foreign aid and FDI in the remittance–savings linkage. Notably, remittances are observed to be a lifeline to savings in countries where foreign aid and inward FDI are improving in the long-run. Likewise, macroeconomic instability, proxied by inflation, is a disincentive to the role of remittance inflows in the saving behavior of the LAC economies. On the other hand, the role of the institutional quality is doubtlessly found important in explaining the extent to which migrant remittances affect savings in the long-run.

The paper proceeds as follows. Section 2 contains our estimation model while Section 3 explains the empirical strategy and the data used for the analysis. The estimation results and discussion are then presented in Section 4. Section 5 concludes the paper.

2 Estimation Model

In the footsteps of Kelly and Mavrotas (2008), inter alia, with a focus on savings, we specify a reduced-form behavioral function for savings that includes some of the aforementioned factors identified in literature, as in Eq. (1):

$$S = f\left(REM, AID, FDI, INST, GDP, INF, Credit, DIR\right) \tag{1}$$

which can linearly be specified as in Eq. (2)

$$S_{it} = \alpha_i + \beta' REM_{it} + \gamma' X_{it} + \mu_i \tag{2}$$

where S_{it} (GS) is the dependent variable for country i at time t; X stands for all other explanatory variables identified from literature, particularly *INST* (institutional quality, proxied by governance quality indicators, PR, and CL); FD is proxied by credit (by banks to private sector) while macroeconomic stability indicators are proxied by inflation (*INF*) and *GDP* as well as interest rates (here proxied by deposit interest rates [*DIR*]); and foreign capital is likewise proxied by *FDI* and foreign *AID*. The main explanatory variable for the study is *REM* (inward remittances).

As argued earlier, the possibility of a conditional behavior of remittances on savings in the LAC region may not be ignored, given the available evidence that the way countries benefit from remittances appears to be positively related to the countries' integrated environment, say, the institutional and macroeconomic environments (Fajnzylber and López, 2008). We contend that a country's level of economic development (*GDP*), institutional quality (*INST*), foreign capital, and macroeconomic stability (*INF*) are each likely to moderate independently the impact of inward remittances on savings. For example, in countries with poor governance ranking, the effect of inward remittances on savings is expected to be low, albeit higher in countries with a better governance quality index. However, the possibility of this not being the case is equally high if remittances substitute the other dwindling forms of foreign capital as a result of deteriorating institutions or other exogenous forces. Therefore, to evaluate the complementarity or substitutability, we introduce relevant interactions in the savings model, namely, remittances with institutional quality ($REM * INST$), with foreign capital ($REM * FC$),

and with macroeconomic stability (*REM* ∗ *INF*). A positive and significant coefficient of the interaction term, say between governance quality and inward remittances, would imply that remittances are more effective in inducing savings in sound institutional environments. In that case, higher institutional quality would be deemed as complimenting remittance inflows to boost savings. On the other hand, the converse would be tantamount to the claim that remittances are a lifeline to savings in institutionally difficult settings. Analogous interpretation interpretations are given to the other interaction effects.

Clearly, interaction terms produce structural multicollinearity because they include the main effects as there is a correlation between the interaction term and both of the main effect terms. In fact, high correlation among interaction terms and main effects is normal, expected, and inevitable. Moreover, it is important to distinguish between the mere presence of multicollinearity, which is not a problem in its own right, and a multicollinearity problem (Schwarz et al., 2014; Aiken and West, 1991). Nevertheless, in order to overcome any possible multicollinearity problem from interaction terms in our model, we followed the recommendation of centering all continuous independent variables in the interaction term (Huang, 2021; Kramer & Blasey, 2004; Aiken and West, 1991). Certainly, and very important to note here, is that multicollinearity can only increase the standard errors (SEs) of the estimated coefficients but does not bias the coefficient estimates; it just decreases efficiency. If the SEs are found small enough that the research goals could be achieved, it would imply no problem with structural multicollinearity (Aiken and West, 1991).

3 Data and Empirical Strategy

3.1 Data

This study focuses on the impact of remittances on savings in the LAC region for the period 1997–2018. The data used in this paper was collected from the World Bank's Development Indicators (WDI), World Bank's Governance Indicators (WGI), and FIW. The final sample after dropping countries with insufficient data includes annual data on 17 countries. These are: Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Guatemala, Guyana, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, and Peru. Apart from Ecuador, which we dropped due to lack of data on many variables under consideration in our models, the sample includes all the other top four remittance recipients in the region in 2018 – Colombia, Dominican Republic, Guatemala, and Mexico, with the latter topping the list. Note that six countries had to be excluded from the initial sample, principally due to lack of data on the variables under analysis. These countries include Cuba, Ecuador, El Salvador, French Guyana, Suriname, Uruguay, and Venezuela.

We use the World Banks GS (current US$) as the principal measure of savings behavior. The World Governance Indicators (WGI) provides six dimensions of governance, viz., Voice and Accountability (VA), PS and Absence of Violence, GE, RQ, RL, and CC. Each index runs from approximately −2.5 to 2.5, with higher values corresponding to better governance (for details, see World Bank, 2018, or the WGI website). Although each of the six sub-indicators considered under the WGI may lack the reliability of the aggregate indicators, an average of the six WGI indexes into a single broader index may still provide important and perhaps

more precise information about different aspects of governance (Langbein and Knack, 2010). In addition to analyzing the individual indicators, as each might behave differently in the remittance–savings model, we transform the WGI into one single number using the principal component analysis (PCA) that results into the weighted sum of standardized variables. Additionally, by transforming the six indicators into one composite indicator, the PCA solves the likely multicollinearity problem since there seems to be a correlation between the six variables (Topal and Sahin, 2017). The alternative measure of institutional quality used in the study is the FIW index. FIW Index of Freedom House constitutes the PR and CL indices, based on a country's total scores for the PR and CL questions. Each index is rated from 1 through 7, with 1 representing the greatest degree of freedom and 7 the smallest degree of freedom. The average of a country's or territory's PR and CL ratings is called the Freedom Rating, and it is this figure that determines the status of free (1.0–2.5), partly free (3.0–5.0), or not free (5.5–7.0). We would expect a negative relationship between poor scores of the index and savings. We report all variables and their definitions, as well as the source of data, in Table 3.

According to the descriptive statistics in Table 4, the LAC countries saved on average US$38.37 billion, which accounts for about 18.6% of total GDP over the study period 1997–2018. Regarding foreign capital, the average contribution came from inward remittances with about 5.2% (equivalent to US$2.54 billion), followed by FDI (4.4% – with a mean of US$6.94 billion) and foreign aid (2.5% – equivalent to US$0.32 billion). The region is on average also observed to have performed very poorly in terms of governance (–0.22), although the level of economic freedom appears fairly favorable, ranking at 61 on average. It is on the basis of the observed variations that we, in addition, seek to investigate the nature of the moderating

Table 3 Variable description and source

Variable name	Definition	Source
GS	GS (current $US)	World Bank WDI
Remittances (REM)	Personal Remittances ($US). Personal remittances comprise personal transfers and compensation of employees.	World Bank WDI
DIR	DIR.	World Bank WDI
Inflation (INF)	IR, Consumer Price Index (annual)	World Bank WDI
GDP	GDP per capita (current $US)	World Bank WDI
Foreign aid (AID)	Foreign Aid (current $US)	World Bank
Institutional quality (INST)	Governance quality indices, including RL, RQ, GE, VA, and CC. Other measures of institutional quality used in the study are PR (PL) and CL indices that constitute the Freedom of the World Index.	World Bank WGI Freedom House
FDI	FDI (current $US)	World Bank WDI
FD	Domestic credit provided by banking sector (current $US)	World Bank WDI
FC dummy	FC of 2007 onward	NA

CC, control of corruption; CL, civil liberties; DIR, deposit interest rate; FC, financial crisis; FD, financial development; FDI, foreign direct investment; GDP, gross domestic product; GE, government effectiveness; GS, gross savings; IR, inflation rate; PR, political rights; RL, rule of law; RQ, regulatory quality; VA, voice and accountability; WDI, World Bank's Development Indicators.

Table 4 Descriptive statistics (*N* = 374) – original values

	Mean	SD	SE (mean)	skewness	kurtosis
GS (billion $))	38.37	79.29	4.11	3.07	12.82
Remittances (billion $)	2.54	5.22	0.27	3.93	19.08
AID (billion $)	0.32	0.34	0.02	2.20	12.27
FDI (billion $)	6.94	14.61	0.76	3.73	19.04
DIR (%)	7.29	5.76	0.30	1.65	6.82
Credit (trillion $)	19.74	65.33	3.38	5.28	34.65
Inflation	6.11	5.15	0.27	3.24	22.42
GDP (billion $)	205.66	430.33	22.25	3.25	14.47
PR	2.52	1.20	0.06	0.73	3.57
CL	2.83	1.06	0.05	0.37	3.13
Institutional quality	−0.22	0.53	0.03	0.80	4.00
Corruption	−0.38	0.63	0.03	1.27	4.93
GE	−0.27	0.60	0.03	0.12	4.10
PS	−0.32	0.60	0.03	−0.43	3.54
RQ	−0.05	0.59	0.03	0.55	3.36
RL	−0.45	0.62	0.03	1.18	4.53
VA	0.14	0.51	0.03	0.05	2.73

Notes: *N* are observations.

Source: Author calculations.

CL, civil liberties; DIR, Deposit interest rate; GDP, gross domestic product; GE, government effectiveness; GS, gross savings; PR, political rights; PS, political stability; RL, rule of law; RQ, regulatory quality; SD, standard deviation; SE, standard error; VA, voice and accountability.

Table 5 Pairwise correlation matrix – transformed variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) DIR	1.000							
(2) GDP	−0.085	1.000						
(3) INF	0.484	−0.205	1.000					
(4) Credit	0.055	0.447	0.075	1.000				
(5) REM	−0.061	0.146	0.105	0.283	1.000			
(6) AID	−0.130	−0.330	−0.022	0.129	0.542	1.000		
(7) FDI	0.112	0.740	−0.041	0.537	0.454	0.148	1.000	
(8) INS	0.006	0.647	−0.206	0.272	−0.393	−0.483	0.454	1.000

Source: Author's calculations.

DIR, deposit interest rate; FDI, foreign direct investment; GDP, gross domestic product; AID, Foreign aid; INF, inflation; REM, remittances.

effects, if any, of the institutional quality and economic freedom in the remittance–savings relationship. We present the pairwise correlation matrix in Table 5. The rest of the control variables have been derived from empirical literature. Note that we use variables in their level form. For, as suggested by Pearson (1897), a formulation in level – with the inclusion of GDP as control variable – would be preferable to a specification in relative terms.

3.2 **Empirical strategy**

3.2.1 **Cross-sectional dependency and homogeneity tests**

Before we explore for the stationarity of the series, the first step was to test the cross-sectional dependence (CD) of the series. The argument here is that during the study period, the LAC region could have been affected by global shocks, such as the global FC of 2007–2009 with heterogeneous impact across countries, thus causing a CD type of correlation. For example, due to the said crisis, remittances sent from migrants in badly affected countries like the USA, where LAC countries have a sizable number of emigrants, could have been drastically affected. Additionally, as Eberhardt and Teal (2011) argue, local spillover effects between countries or regions may result into further CD correlations. Therefore, the importance of CD, as well as homogeneity among the variables in the selection of appropriate panel unit root tests and cointegration tests in an empirical analysis, cannot be underestimated (Bayar and Gavriletea, 2018). Performing CD tests is deemed important in fitting panel-data models like ours.

Since in the present study, the time dimension (T) is greater than the cross-sectional units (N), we employ the Lagrange multiplier (LM) adjusted test provided by Pesaran and Yamagata (2008) to test for cross-sectional dependency.[1] As the results in Table 6 show, the null hypothesis of cross-sectional independence is rejected at a 1% level of significance. The results of the Pesaran CD test on the individual variables are likewise presented in Table 7, where the test reveals the presence of CD in all variables, except two governance indicators, viz., CC and RL. Here, the average correlation (corr) in the panel for these variables was near zero. Therefore, for the two cases, the null hypothesis of cross-sectional independence could not be rejected.

Table 6 Cross-sectional dependence and homogeneity tests – full sample

Type of tests, literature references	Statistic	*p*-value
Cross-dependency tests		
LM (Breusch and Pagan, 1980)	246.6	0.0000
LM adj* (Pesaran and Yamagata, 2008)	5.243	0.0000
LM CD* (Pesaran, 2004)	6.346	0.0000
Homogeneity tests		
Pesaran and Yamagata (2008) (PY)		
Delta	7.024	0.0000
Delta_adj.	9.137	0.0000
Blomquist and Westerlund (2013) (BW)		
Delta	8.429	0.0000
Delta_adj.	10.965	0.0000

Notes: *two-sided test.
Source: Author's calculations.
LM, Lagrange multiplier; CD, cross-sectional dependence.

1 LM CD test of Pesaran (2004) is normally used when the time dimension (T) is lower than the cross-sectional dimension (N) in the dataset.

Table 7 Pesaran CD test

	CD-test	*p*-value	corr	abs(corr)
Remittances	48.1	0.000	0.912	0.912
Foreign aid	8.01	0.000	0.154	0.281
FDI	30.9	0.000	0.564	0.569
DIR	28.94	0.000	0.529	0.592
Inflation	13.85	0.000	0.253	0.353
GDP	51.21	0.000	0.936	0.936
Credit	52.1	0.000	0.952	0.952
Institutional quality index (INST)	8.01	0.000	0.146	0.337
PS index	6.15	0.000	0.112	0.358
RQ index	9.97	0.000	0.182	0.399
GE index	6.62	0.000	0.123	0.428
CC index	0.82	0.413	0.015	0.317
RL index	−1.52	0.127	−0.028	0.340
Change in VA index	5.54	0.000	0.104	0.294

Notes: Presuming the null hypothesis of cross-sectional independence, the Pesaran statistic (CSD) is assigned as N (0, 1) with Stata command XTCSD. The average correlation (corr) and absolute average correlation (Abs [corr]) coefficients existing between each type of energy variable are estimated. All variables are logged except inflation and the institutional indices.

Source: Author's calculations.

CC, control of corruption; DIR, Deposit interest rate; FDI, foreign direct investment; GDP, gross domestic product; GE, government effectiveness; PS, political stability; RL, rule of law; RQ, regulatory quality; VA, voice and accountability.

Overall, however, the null hypothesis of cross-sectional independence is rejected at the 1% significance level, among the countries in the panel.

Relatedly, according to Breitung et al. (2016), it is important to test the assumption of slope homogeneity before applying standard panel data techniques. For our paper, we employed the delta tilde and adjusted delta tilde tests provided by Pesaran and Yamagata (PY) (2008). It is likely that dynamic panel datasets exhibit serial correlation. Blomquist and Westerlund (BW) (2013) propose using the Heteroskedasticity and Autocorrelation Consistent (HAC) robust SEs to account for autocorrelation in the residual. The findings from both PY and BW in Table 5 indicate that the null hypothesis that slope coefficients are homogenous is rejected, implying that the cointegrating coefficients are heterogeneous. In this regard, we proceed to use the panel unit root test and cointegration test that take care of heterogeneity and CD.

3.2.2 **Testing for stationarity in panel data – unit root tests**

In the next step, after testing for CD and slope homogeneity, we analyze the stationary properties of the variables, to guide on the appropriate estimation technique for the study.

Several panel unit root tests for stationarity are often grouped as first-generation (e.g. Levin et al. (2002) or LLC test; the Im et al. (2003) or Im, Pesaran and Shin (IPS) test); Breitung (2000) test; Hadri (2000); Fisher tests suggested by Maddala and Wu (1999) and Choi (2002); and second-generation tests [e.g., Cross-sectional Augmentd Dickey Fuller (CADF) and

Cross-sectional Im, Pesaran and Shin (CIPS) tests by Pesaran (2007)].[2] Essentially, the difference between the two is that while the first-generation tests assume cross-sectional independence, the latter explicitly allow for some form of CD. It is important to note, however, that in the presence of CD, first-generation tests tend to have serious size distortions and therefore perform poorly by consequently leading to the over-rejection of the null hypothesis (unit root) when the sources of non-stationarity are common across individuals (Banerjee et al., 2005).

On the other hand, the second-generation unit root tests explicitly allow for some form of CD. Moreover, second-generation tests such as the IPS's t-bar test by Pesaran (2003) and Z-test by Choi (2002), inter alia, are all applicable to both, when observations are greater than the time periods (N > T) or vice versa (T < N), and are shown to have good size and power properties, even when N and T are relatively small (e.g., 10). Nevertheless, one caveat to consider is that the t-bar statistic can only be computed for balanced panels whereas for unbalanced panels, the modified Z-test can be reported.

In the current study, we employ second-generation tests since there is evidence of CD and heterogeneity in the series. Specifically, we adopt the CADF test by Pesaran (2007) test, which is an augmentation of the individual Dickey–Fuller (DF) regressions with cross section averages.[3] Procedurally, the Augmented Dickey Fuller (ADF) regression is expanded with cross-sectional means of the first differences and the lagged values of cross sections. For decision purposes, if the CADF statistic values are larger than the critical value, the null hypothesis suggesting that there is no unit root is rejected. For robustness check, however, we also present results from the Maddala and Wu (1999), one of the first-generation unit root tests, here denoted as Maddala and Wu (MW) test. Findings presented in Table 8 indicate that while all the other variables are I(0), remittances, DIR, GDP PR, CL, savings, and credit, are I(1).

3.2.3 **Panel cointegration tests**

With unit roots proved in existence, we next test for cointegration. There are several cointegration tests for long-run relationships among series. One of the most commonly used tests is the one by Pedroni (1999). Despite its power to test for cointegration in homogeneous panels (in the first set of the test) and also to test for cointegration in heterogeneous panels (in the second test statistic), its disadvantage is that it has limited allowance for CD. Therefore, we additionally employ the Westerlund–Durbin–Hausman (2008) test built for such panel data series, but also conditional on the dependent variable exhibiting I(1) and never I(0). The independent variables can be either I(1) or I(0). The test uses a different approach that imposes fewer restrictions compared to other tests. Nevertheless, a similar null hypothesis of "no cointegration" is tested, but the alternative hypothesis is different, namely, that some (not necessarily all) of the panels are cointegrated. Additionally, the test is known to perform well in the presence of structural breaks in the intercept and slope of the cointegrated regression, error terms with serial correlation, and heteroscedasticity. The results from the latter test are presented in Table 9, where the null hypothesis of "no cointegration" is rejected at a 1% level of significance.

We present the results from the Kao (1999) test as well as from the Pedroni (1999) test in Table 10. Note that the Kao test reports five statistics: Dickey–Fuller, Modified Dickey–Fuller,

2 See Hlouskova and Wagner (2007) and Hurlin and Mignon (2007) for details.

3 Several other second-generation tests for unit root have been designed by Chang (2002, 2004), Bai and Ng (2004), Phillips and Sul (2003), and Moon and Perron (2004) among others.

Table 8 Panel unit root tests – first and second generations

	First-generation test		Second-generation test	
	MW test	MW test	CADF test	CADF test
	No trend	With trend	No trend	With trend
REM	62.99***	35.53	−1.885	−2.574
ΔREM	196.96***	172.9***	−3.926***	−3.945***
AID	138.49***	152.9***	−3.36***	−3.97***
ΔAID	733.15***	613.58***	−5.64***	−5.54***
FDI	54.53**	72.11***	−2.86***	−3.23***
ΔFDI	439.49***	348.9***	−5.33***	−5.35***
DIR	54.00**	18.9	−2.26**	−2.25
ΔDIR	226.91***	194.31***	−3.68***	−3.86***
INF	145.31***	134.29***	−2.81***	−2.71**
ΔINF	488.03***	402.33***	−4.69***	−4.79***
GDP	12.61	14.76	−2.62***	−2.62
ΔGDP	150.4***	108.85***	−3.83***	−3.92***
INST	34.76	77.89***	−1.96	−2.96***
ΔINST	358.02***	302.19***	−4.39***	− 4.41***
Credit	25.84	12.99	−1.33	−1.98
Δcredit	194.12***	183.35***	−3.61***	−4.01***
CC	54.00**	39.37	−2.34***	−2.67*
ΔCC	371.13***	317.23***	−4.54***	−4.71***
PS	52.01**	55.99**	−2.26**	−3.23***
ΔPS	383.63***	305.27***	−5.00***	−5.06***
RQ	49.21**	440.96***	−2.26**	−2.73**
ΔRQ	46.86*	364.06***	−4.63***	−4.65***
RL	49.95**	47.12*	−1.85	−2.49
ΔRL	278.29***	231.07***	−3.96***	−3.99***
GE	53.5**	46.11*	−2.07*	−2.56
ΔGE	336.32***	263.68***	−4.28***	−4.24***
VA	69.27***	62.48***	−1.62	−2.25
ΔVA	335.34***	267.89***	−4.29***	−4.44***
POLRIGHTS	75.33***	65.25***	−1.81	−2.22
ΔPOLRIGHTS	383.95***	320.25***	− 3.97***	− 4.27***
CIVLIB	40.91	21.81	−1.16	−1.59
ΔCIVLIB	244.03***	206.64***	−2.79***	− 2.98***
GS	8.319	27.27	−2.51**	−2.92***
ΔGS	269.45***	198.02***	−4.83***	− 4.84***

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; Δ denotes first differences. In the Pesaran (2007) CADF test, rejection of the null hypothesis indicates stationarity in at least one country. In the MW test, the rejection of the null of unit root implies stationarity.

CC, control of corruption; DIR, deposit interest rate; FDI, foreign direct investment; GDP, gross domestic product; GE, government effectiveness; GS, gross savings; PS, political stability; RL, rule of law; RQ, regulatory quality; VA, voice and accountability; CIVLIB, civil liberties; INF; inflation; REM, remittances.

Table 9 Westerlund (2008) cointegration test

	Statistic	Value	Z-value	*p*-value
Inward remittances	Gt	−2.917	−2.879	0.002***
	Ga	−16.403	−2.793	0.003***
	Pt	−11.065	−2.741	0.003***
	Pa	−14.969	−4.152	0.000***
FDI	Gt	−2.901	−2.80	0.003***
	Ga	− 21.476	−5.937	0.000***
	Pt	−10.784	−2.414	0.008***
	Pa	−15.976	−4.847	0.000***
Foreign aid	Gt	−2.658	−1.549	0.061*
	Ga	−16.466	−2.831	0.002***
	Pt	−10.490	−2.072	0.019**
	Pa	−13.870	−3.394	0.000***
DIR	Gt	−2.796	−2.257	0.012**
	Ga	−17.132	−3.244	0.001***
	Pt	−12.307	−4.188	0.000***
	Pa	−16.571	−5.258	0.000***
Inflation	Gt	−2.442	−0.443	0.329
	Ga	−16.184	−2.657	0.004***
	Pt	−9.717	−1.171	0.121
	Pa	−13.221	−2.946	0.002***
GDP	Gt	−3.234	−4.507	0.000***
	Ga	−13.383	0.921	0.179
	Pt	−10.895	−2.544	0.006***
	Pa	−13.402	−3.070	0.001***
Governance quality	Gt	−2.699	−1.759	0.039**
	Ga	−17.735	−3.618	0.000**
	Pt	−10.464	−2.041	0.021**
	Pa	−13.557	−3.178	0.001***
FD	Gt	−2.969	−3.146	0.001***
	Ga	−11.525	0.231	0.591
	Pt	−11.139	−2.828	0.002***
	Pa	−11.076	−1.465	0.071*
PR	Gt	−2.948	−3.040	0.001***
	Ga	−17.790	−3.652	0.000***
	Pt	−11.395	−3.126	0.001***
	Pa	−14.642	−3.926	0.000***
CL	Gt	−3.044	−3.532	0.000***
	Ga	−17.083	−3.214	0.001**
	Pt	−10.286	−1.834	0.033**
	Pa	−12.651	−2.552	0.005***

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. The Gt and Ga statistics test cointegration for each cross section, and Pt and Pa test cointegration in the panel. The null hypothesis is no cointegration. Number of lags determined by AIC. The dependent variable is GS.

Source: Author's calculations.

CL, civil liberties; DIR, Deposit interest rate; FDI, foreign direct investment; GDP, gross domestic product; GS, gross savings; PR, political rights.

Table 10 Cointegration test results

	Statistic	*p*-value
a) Kao test for cointegration		
Modified DF t	−7.5867	0.0000
DF t	−5.7238	0.0000
Augmented DF t (McCoskey and Kao (1998)	−3.8749	0.0001
Unadjusted modified DF	−8.9975	0.0000
Unadjusted DF t	−6.0623	0.0000
b) Pedroni test for cointegration		
Modified Phillips–Perron t	4.7103	0.000
Phillips-Perron t	−1.8689	0.0308
Augmented DF t	−1.2168	0.1118

Notes: For Pedroni – Ho: No cointegration; Ha: All panels are cointegrated; No trend included. For Kao – Ho: No cointegration; Ha: Some panels are cointegrated; No trend included. The lags used were automatically selected based on the Newey–West bandwidth using the Bartlett kernel.

***Indicates the parameters are significant at 1% probability.

Source: Author's calculations.

DF, Dickey–Fuller.

Augmented Dickey–Fuller, Unadjusted Dickey–Fuller, and Unadjusted modified Dickey–Fuller. There is significant evidence the tests reject the null of no cointegration at a 1% level of significance. By implication, all panels are cointegrated in the long-run. Therefore, we proceed to estimate our model as explained in the next subsection.

3.2.4 **Estimation technique**

The panel unit root tests proposed above aim to assess the order of integration of the variables. If the main variables are found to be integrated of order one, then we should use panel cointegration tests to address the non-stationarity of the series. Given that the individual variables of the model are a mixture of integration of order zero, I(0), and order one, I(1), we adopt the panel ARDL approach (Pesaran and Shin, 1999),[4] which is useful for forecasting and disentangling long-run relationships from short-run dynamics. Essentially, the ARDL (p, q) model consists of lag *p* on the response variable and lag *q* for the explanatory variables. Specifically, we consider an error correction format of an ARDL (p, q) model as:

$$\Delta y_{it} \phi_i y_{it-1} \beta_i X_{it} \sum_{j1}^{p-1} \lambda_{ij} \Delta y_{it-1} \sum_{j0}^{q-1} \delta_{ij} \Delta X_{it-j} \mu_i \tag{3}$$

where X is a vector of explanatory variables including inward remittances; β contains information about the long-run impacts; ϕ_i is the error correction term (ECT) (due to normalization), also known as the coefficient of speed of adjustment to the long-run equilibrium; λ and δ represent the short-run coefficients of lagged dependent and independent variables respectively; ε_{it} is the error term with zero mean and a finite variance ($\varepsilon_{it} \sim iidN(0, \delta_i^2)$; $i = 1,\ldots,N$ represents the

4 As the authors contend, the ARDL model requires that variables are stationary at level, at first difference, or that variables are stationary at both level and first difference, but not at second difference. Otherwise, the technique fails to work in cases where variables are stationarity at second or even higher difference. Therefore, we carry out the unit root tests to make sure that no series exceeds I(1) order of integration.

number of countries used in the study; and $t = 1,\ldots,T$ denotes the period in years. We expect the ECT to be negative and significant so as to show the existence of stability in the long-run relationship. The other explanatory variables include DIR, GDP per capita, inflation, FDI, foreign aid, a dummy for FC of 2007, credit, and institutional quality indices, the latter of which constitute PR, CL, the overall governance quality index, and the individual six governance indicators, viz., CC, PS, RL, RQ, GE, and VA.

However, we are fully aware that in empirical work, one way to obtain consistent estimates in dynamic panels with considerable heterogeneity across regions is to use estimators that allow for slope heterogeneity across states (Bakas et al., 2016). As suggested by Pesaran et al. (1999), we adopt the maximum-likelihood pooled mean group (PMG) estimator to estimate Eq. (3) since the data series exhibit panel heterogeneity and cross-sectional dependency. In addition, as argued by its protagonists, the approach fits an ARDL model to the data, in which the ECT is specified for easier economic interpretation. Moreover, it is sufficient to aver that the PMG estimator, which by definition uses the panel extension of the single-equation ARDL model, is additionally credited for simultaneously showing both the long-run and short-run behaviors of the model variables across sections. Implicitly, its usage allows provision of information on, say, the contemporaneous impacts and speed of adjustment to equilibrium. As Martins (2006) presents, the other unignorable advantage of PMG is that while the long-run coefficients are assumed to be homogeneous (i.e., identical across panels), the short-run coefficients are allowed to be country-specific (heterogeneity). In the case of LAC countries, it makes great sense in assuming a common long-run equilibrium relationship. Moreover, the PMG estimator provides consistent coefficients, as it takes care of any possible presence of endogeneity, because it includes lags of dependent and independent variables. Pesaran et al. (1999) further argue that the advantage of the PMG model is that it is notably appropriate for non-stationary panels where N and T are relatively large (e.g., if T = 32 and N = 24; and if T = 17 and N = 10). For the current study, we have T = 22 and N = 17.

Alternatively, two other estimators, inter alia, would be appropriate for Eq. (3). These are the Mean Group (MG) estimator proposed by Pesaran and Smith (1995), and the dynamic fixed effects (DFE) estimator attributed to Pesaran and Smith (1997). Regarding the latter, strong slope homogeneity across individual cross sections is assumed, with the exception of the fixed effects. Thus, it assumes short-run and long-run parameter homogeneity. Therefore, the estimator is inconsistent if there is heterogeneity, but also biased when applied to dynamic models, though the size of the bias tends to zero as the time dimension grows (Nickell, 1981). The MG estimator, on the other hand, obtained by estimating one equation per group and taking the average across groups, allows for heterogeneity in every dimension by allowing the long-run parameters to vary, but the downside is that it does not concern itself with CD. Hence, in the face of CD, the MG estimation procedure could lead to biased and inconsistent results. The econometric benefit attached to MG is its consistency, whether the real model is homogeneous or heterogeneous (Pesaran and Smith, 1995). Nevertheless, MG estimators cannot handle parameter similarities across individual cross sections. Moreover, as Hakan et al. (2017) add, the MG estimator is characterized by sensitivity to outliers and selection of lag orders. Comparatively, both MG and PMG are consistent for large panels, while MG is more efficient under assumption of no homogeneity across slope parameters.

It is on account of the aforementioned disadvantages of DFE and MG estimators, that PMG—which was developed as an intermediate estimator between MG and DFE to handle parameter similarities across individual cross sections via pooling while imposing no restriction about the slope parameter homogeneity—is adopted here. Note should however be made that this estimator is inconsistent if the true model is homogeneous, but it is efficient if the long-term coefficient is homogeneous. Nevertheless, in order to determine the most efficient approach preferred for estimating the panel ARDL model in Eq. (3), we test the PMG's poolability assumption through a Hausman test. The decision criterion here is that once the *p*-value is greater than 5% then PMG will be the preferred model.[5] As evidence will shortly show, the PMG is the preferred estimator in relation to MG and DFE estimators.

Finally, it is important to determine the ARDL lag structure by some consistent information criterion. Given the limited time dimension of 22 years, not long enough to overextend the lags, we impose a common lag structure across the LAC countries, as suggested in the previous literature (e.g. Loayza and Ranciere, 2006; Demetriades and Law, 2006). The Schwartz Bayesian criterion is the basis on which the appropriate lag structure is selected here. For, according to Pesaran and Smith (1998), a model chosen by Schwarz Information Criterion (SBIC) is a more parsimonious model that saves degrees of freedom especially in studies with small sample size like the current study.

4 Results and Discussion

4.1 Remittance and savings

In Table 11, the importance of inward remittances in orchestrating savings is confirmed in all specifications both in the short-run and long-run. Generally, the impact appears quantitatively bigger in the short-run relative to the long-run. For example, in the long-run, if remittance inflows increase by 1%, we would expect savings to increase by 0.10% after controlling for DIR, GDP per capita, and inflation. Under similar conditions, the short-run equivalent increase would on the other hand be more than double, at about 0.22%. The level of significance, however, differs. As evident in Column (2), the relevant coefficient is highly significant at the 1% statistical level in the long-run whereas only significant at the 5% statistical level in the short-run. The results appear similar once foreign aid is under control. However, if we, in addition, control for inward FDI, the story becomes more interesting. Here, a change in remittances by 10% is likely to result into about 0.9% increase savings in the long-run and to 1.8% in the short-run, though the level of significance appears to reduce to 5% in the latter case. The equivalent increase would tantamount to about 2% and 0.8% increase in savings in the short-run and long-run when both forms of foreign capital are controlled for in addition to other variables, as evident in Column (5). There is thus clear evidence that in relation to other foreign capital inflows, the effect of remittances on savings is observed to be greater in both magnitude and level of significance, both in the short and long terms. Baldé (2011) documents similar findings for Sub-Saharan Africa. In specification (6), in addition to other controls mentioned earlier, we control FD, but the positive contribution of remittances to savings remains intact, albeit

5 First, the Hausman test helps us choose between DFE and MG, and we discover that MG is a better estimation technique. Thereafter, it enables us to choose between MG and PMG, and we discover that PMG is a better estimation technique.

Table 11 Remittances and savings

	(1) TRAD	(2) REM	(3) AID	(4) FDI	(5) FC	(6) FD	(7) GOV
Long-run							
DIR	−0.012**	−0.002	−0.003	−0.000	0.001	−0.014***	−0.002
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)
GDP	0.879***	0.879***	0.886***	0.942***	0.958***	0.897***	1.228***
	(0.040)	(0.040)	(0.039)	(0.048)	(0.047)	(0.061)	(0.052)
INF		0.005*	0.006*	0.003	0.003	0.009**	−0.009**
		(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Remittances (REM)		0.102***	0.100***	0.086***	0.080***	0.056*	−0.065*
		(0.027)	(0.027)	(0.026)	(0.026)	(0.032)	(0.035)
Foreign aid			0.013		0.012		0.176***
			(0.015)		(0.015)		(0.022)
FDI				−0.057**	−0.044*		−0.249***
				(0.023)	(0.023)		(0.026)
Credit						0.013	
						(0.036)	
INST							0.075***
							(0.012)
Speed of adjustment							
ECT	−0.361***	−0.430***	−0.432***	−0.429***	−0.443***	−0.412***	−0.234***
	(0.051)	(0.063)	(0.064)	(0.069)	(0.073)	(0.056)	(0.067)
Short-run							
DIR	0.030*	0.033	0.030	0.031*	0.027	0.037	0.031*
	(0.017)	(0.023)	(0.023)	(0.018)	(0.018)	(0.024)	(0.018)
GDP	1.357***	1.264***	1.256***	1.342***	1.316***	1.273***	1.584***
	(0.290)	(0.312)	(0.304)	(0.345)	(0.324)	(0.291)	(0.366)
INF		−0.006**	−0.006***	−0.007**	−0.008**	−0.007**	−0.013
		(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.010)
REM		0.219**	0.220**	0.180**	0.202**	0.277**	0.290**
		(0.096)	(0.095)	(0.090)	(0.090)	(0.110)	(0.114)
AID			0.021		0.005		−0.011
			(0.017)		(0.021)		(0.031)
FDI				0.047	0.047		0.102
				(0.032)	(0.040)		(0.087)
Credit						−0.236	
						(0.164)	
INST							0.050
							(0.089)
Observations	357	357	357	357	357	357	357

Notes: All variables are in their level form and logged, apart from IR, interest rates, and institutional quality; GDP, remittances, foreign aid, and FDIs are all in billions; estimations are based on the PMG estimator chosen over the MG estimator based on the Hausman test where all *p*-values were found to be greater than 5% in all specifications. The Hausman test with a *p*-value greater than 5% informed the choice of PMG over the MG estimator; SEs in parentheses.

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

Source: Author calculations.

DIR, Deposit interest rate; ECT, error correction term; FC, financial crisis; FDI, foreign direct investment; GDP, gross domestic product; MG, mean group; PMG, pooled mean group; SE, standard error; GOV, governance; AID, foreign aid; TRAD, traditional; REM, Remittances; INF, inflation.

at a lower level of significance, just as appears to be the case when we also control for governance quality in (7) in the short-run period. Surprisingly, the long-run effect of migrant transfers when governance quality is controlled for is negative though weakly significant. We dig deeper into this result by looking at the disaggregated impact of various institutional indices on savings.

Back to the foreign capital variables, specifically, while a 100% change in FDI is likely to attract a minimal of 5.7% reduction in savings in the long-run, there is evidence of the aid effect both in the long-run and short-run in the LAC countries during the study period. The detrimental effect of FDI inflows on savings in the long-run as well as the insignificant outcome of foreign aid relative to migrant transfers is a clear evidence of the growing importance of inward remittances in relation to either FDI or AID, in terms of their influence on savings.

It is however important to note that once institutional quality is controlled for, particularly governance indicators (except for corruption) and freedom indices, remittances appear detrimental to savings, and by implication to economic development in the long-run. Tables 12–14 demonstrate the relevant evidence. The introduction of economic freedom, for example in in Table 12, Columns (3) and (5), in addition to other forms of foreign capital (aid, FDI), monetary policy (interest rate), macroeconomic stability (inflation), and economic development reveals a detrimental effect of migrant transfers to savings in the long-run. The observed effect is nevertheless still positive in the short-run and everywhere at higher magnitude. These findings are reflective of the plausible importance of institutional quality and macroeconomic instability, as well as non-remittance foreign capital in the remittance–savings relationship. We explore this possibility later. Momentarily, it suffices to note that on average there is reliable empirical evidence of the direct significant contribution of remittance inflows to savings in the LAC region. Nevertheless, the finding is not uncommon in the existing literature as previous studies have likewise recorded a positive remittance effect on domestic savings albeit for regions/countries other than the LAC region [e.g., Baldé (2011) for 37 SSA countries, Gani (2016) for the Asian economies, Osili (2007) and Gani (2016) for Asian countries, Akter (2018) for Bangladesh and Philippines, Munir et al. (2011) for Pakistan, Hamdar and Nouayhid (2017) for Lebanon, and Jukan et al. (2020) for the youth in South East Europe].

4.2 **Institutional quality and savings**

The results in Table 12 reveal that in the long-run, a deterioration of CL would adversely affect savings. The impact is significant at the 1% conventional level; specifically, a 1% increase in the country's CL index would result into increased savings by about 0.278%, other factors constant. On the other hand, an improvement in CL may not lead to increased savings in the short-run, though the relevant coefficient is weakly significant at a 10% statistical level. Additionally, there is no evidence in data to ascertain any significant role of PR in the savings among the LAC countries, whether in the short-run or long-run.

Still, on the institutional quality, the coefficient on the overall index of governance suggests that countries that invest in improving governance quality are likely to increase their savings. The results in Table 12, Column (1) specifically reveal that in the long-run, an improvement in the index by 1 (unit) would yield a positive change in the savings by 7.5%, ceteris paribus. At the disaggregated level, however, Tables 13 and 14 report interesting findings. While in the

Table 12 Governance, PR, CL, and FC on savings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INST	**REM × INST**	**PR**	**REM × PR**	**CL**	**REM × CL**	**FC**	**REM × FC**
Long-run								
Inward Remittances (REM)	−0.065*	0.014	0.084***	0.060	0.150***	0.331**	0.047*	0.084***
	(0.035)	(0.030)	(0.026)	(0.037)	(0.025)	(0.134)	(0.026)	(0.022)
Foreign Aid	0.176***	−0.032***	0.021	−0.101***	−0.005	0.242***	0.063***	0.012
	(0.022)	(0.012)	(0.017)	(0.030)	(0.011)	(0.014)	(0.019)	(0.019)
Inward FDI	−0.249***	−0.098***	−0.040*	0.079***	−0.070***	−0.399***	−0.089***	−0.083***
	(0.026)	(0.021)	(0.024)	(0.022)	(0.021)	(0.022)	(0.016)	(0.014)
DIRs	−0.002	0.003	0.000	−0.028***	−0.002	−0.007***	−0.007**	−0.002
	(0.002)	(0.005)	(0.004)	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)
Inflation	−0.009**	−0.007*	0.006**	−0.003	−0.003	0.003	0.004	−0.000
	(0.004)	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)
GDP	1.228***	1.006***	1.010***	0.692***	0.803***	1.394***	1.143***	1.080***
	(0.052)	(0.041)	(0.050)	(0.064)	(0.051)	(0.041)	(0.051)	(0.048)
Governance Quality (INST)	0.075***	−0.092***						
	(0.012)	(0.022)						
REM × INST		−0.013***						
		(0.005)						
PR			−0.031	0.196***				
			(0.047)	(0.063)				
REM × PR				0.061***				
				(0.023)				
CL					0.278***	0.541***		
					(0.045)	(0.132)		
REM × CL						−0.746***		
						(0.156)		
FC							−0.173***	−0.206***
							(0.036)	(0.041)
REM × FC								0.036**
								(0.018)
Speed of adjustment								
ECT	−0.234***	−0.406***	−0.444***	−0.361***	−0.368***	−0.142**	−0.399***	−0.440***
	(0.067)	(0.095)	(0.076)	(0.070)	(0.087)	(0.065)	(0.073)	(0.087)
Short-run								
Inward Remittances (REM)	0.290**	0.272**	0.246***	0.449**	0.205**	−1.557*	0.168*	0.091
	(0.114)	(0.136)	(0.093)	(0.194)	(0.100)	(0.920)	(0.092)	(0.097)
Foreign Aid	−0.011	0.014	0.002	−0.000	0.003	−0.004	0.001	0.015
	(0.031)	(0.027)	(0.021)	(0.017)	(0.022)	(0.022)	(0.022)	(0.018)

(*Continued*)

Table 12 Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INST	**REM × INST**	**PR**	**REM × PR**	**CL**	**REM × CL**	**FC**	**REM × FC**
Inward FDI	0.102	0.072	0.056	0.013	0.052	0.052	0.051	0.038
	(0.087)	(0.084)	(0.048)	(0.052)	(0.053)	(0.067)	(0.042)	(0.037)
DIRs	0.031*	0.029	0.024	0.034*	0.021	0.022	0.036*	0.039*
	(0.018)	(0.018)	(0.018)	(0.020)	(0.018)	(0.014)	(0.021)	(0.020)
Inflation	−0.013	−0.013	−0.009***	−0.004	−0.006*	−0.010**	−0.005*	−0.003
	(0.010)	(0.010)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
GDP	1.584***	1.575***	1.189***	1.344***	1.446***	1.776***	1.402***	1.470***
	(0.366)	(0.386)	(0.341)	(0.308)	(0.352)	(0.459)	(0.443)	(0.474)
Governance Quality (INST)	0.050	0.025						
	(0.089)	(0.122)						
REM × INST		−0.009						
		(0.053)						
PR			−0.072	−0.659				
			(0.096)	(0.490)				
REM × PR				−0.246				
				(0.229)				
CL					−0.264*	4.734		
					(0.148)	(4.273)		
REM × CL						2.129*		
						(1.251)		
FC							0.054	0.195
							(0.039)	(0.206)
REM × FC								0.049
								(0.150)

Notes: The Hausman test with a *p*-value greater than 5% informed the choice of PMG over the MG estimator; SEs in parentheses; Total observations (*N*) are 357.

Source: Author calculations.

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

CL, civil liberties; DIR, deposit interest rate; ECT, error correction term; FC, financial crisis; FDI, foreign direct investment; GDP, gross domestic product; MG, mean group; PMG, pooled mean group; PR, political rights; SE, standard error.

long-run CC, PS, RQ, and RL exhibit a positive relationship with savings, GE appears deleterious to savings in the long-run. VA is only significantly important to savings in the short-run. The relevant coefficient is significant at the 1% conventional level. The facilitative role of the governance environment confirms Dunning's (2002) argument that institutional factors are becoming increasingly important determinants of macroeconomic performance. In line with Giuliano and Ruiz-Arranz (2009), we investigate the indirect role of remittances via these and other factors as moderators. For, as earlier argued, foreign capital may only be more effective in a good policy environment such as a good investment climate with well-developed financial systems and sound institutions. We next present the results pertaining to this possibility.

Table 13 Individual governance indicators and savings

	(1)	(2)	(3)	(4)	(5)	(6)
	CC	**REM × CC**	**PS**	**REM × PS**	**RQ**	**REM × RQ**
Long-run						
Remittances (REM)	−0.134***	0.065**	−0.085***	−0.112**	−0.109***	0.049*
	(0.035)	(0.026)	(0.031)	(0.046)	(0.041)	(0.030)
Foreign Aid	0.166***	−0.009	0.194***	0.220***	0.183***	0.004
	(0.020)	(0.018)	(0.020)	(0.018)	(0.019)	(0.010)
FDI	−0.266***	−0.035*	−0.212***	−0.247***	−0.291***	−0.060**
	(0.021)	(0.021)	(0.024)	(0.024)	(0.026)	(0.024)
DIR	−0.006***	0.003	0.004**	0.005***	−0.005***	0.007**
	(0.001)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)
Inflation	−0.003	−0.001	−0.015***	−0.017***	−0.002	−0.001
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
GDP	1.273***	0.936***	1.224***	1.255***	1.298***	1.023***
	(0.037)	(0.051)	(0.048)	(0.050)	(0.044)	(0.041)
CC	0.005***	0.000				
	(0.001)	(0.001)				
REM × CORR		−0.037**				
		(0.015)				
PS)			0.208***	0.242***		
			(0.026)	(0.044)		
REM × PS				−0.080		
				(0.049)		
RQ					0.206***	−0.058
					(0.031)	(0.057)
REM × RQ						−0.084***
						(0.016)
Speed of adjustment						
ECT	−0.236***	−0.442***	−0.209***	−0.190***	−0.205***	−0.486***
	(0.078)	(0.085)	(0.061)	(0.062)	(0.065)	(0.089)
Short-run						
Remittances (REM)	0.235***	0.317**	0.230**	0.216**	0.218**	0.173*
	(0.086)	(0.141)	(0.090)	(0.095)	(0.086)	(0.091)
Foreign Aid	−0.032	−0.007	−0.002	−0.001	−0.017	0.003
	(0.041)	(0.030)	(0.020)	(0.020)	(0.023)	(0.018)
FDI	0.090	0.053	0.067	0.069	0.085	0.051
	(0.077)	(0.055)	(0.056)	(0.058)	(0.076)	(0.056)
DIR	0.036*	0.030	0.029*	0.029*	0.028**	0.022*
	(0.021)	(0.023)	(0.017)	(0.016)	(0.013)	(0.012)
Inflation	−0.009	−0.009*	−0.008	−0.008	−0.005	−0.006
	(0.006)	(0.005)	(0.007)	(0.007)	(0.006)	(0.004)

(*Continued*)

Table 13 Continued

	(1)	(2)	(3)	(4)	(5)	(6)
	CC	**REM × CC**	**PS**	**REM × PS**	**RQ**	**REM × RQ**
GDP	1.523***	1.270***	1.702***	1.819***	1.660***	1.315***
	(0.322)	(0.245)	(0.305)	(0.404)	(0.354)	(0.281)
CC	0.002	0.003				
	(0.004)	(0.005)				
REM × CC		0.223**				
		(0.098)				
PS			−0.034	−0.218		
			(0.103)	(0.297)		
REM × PS				−0.037		
				(0.079)		
RQ					0.081	−0.194
					(0.176)	(0.168)
REM × RQ						−0.067
						(0.083)

Notes: The Hausman test with a *p*-value greater than 5% informed the choice of PMG over the MG estimator; SEs in parentheses; Total observations (*N*) are 357.

Source: Author calculations.

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

CC, control of corruption; DIR, deposit interest rate; ECT, error correction term; FDI, foreign direct investment; GDP, gross domestic product; MG, mean group; PMG, pooled mean group; PS, political stability; RQ, regulatory quality; SEs, standard errors.

4.3 **Interaction effects**

From Tables 12–14, the adverse effects of poor governance quality on savings in the long-run appear mitigated by an increase in inward remittances for the LAC region. This observation is valid for the overall index of governance quality [Table 12, Column (2)] as well as several individual indicators, namely, corruption, RQ, and VA (Tables 13 and 14) in the long-run. The finding is partly in line with Abu (2015) for the ECOWAS region, where PS is found to affect savings both directly and indirectly via income growth. On the other hand, it is also revealed that betterment in CC would facilitate the inward remittance contribution to savings in the short-run. Again, here, the effect of inward remittances on savings is observed to increase in countries where the RL deteriorates. By implication, countries where the RL is upheld paramount may use other forms of capital for their savings and less of remittances.

Still on institutional quality, in Table 12, it is ascertained that an improvement in the observation of PR on the one hand and CL on the other would act as fertile grounds in moderating the remittance-savings relationship in the long-run. Specifically, it can be argued that while remittances play a big role in an environment where PR are highly observed in the long-run, remittances mitigate the adverse effects of poor CL on savings. In the short-run, however, upholding CL provides a facilitative role for remittances to savings in the LAC region. The results suggest that while in the long-run, inward remittances in the LAC countries are

Table 14 Individual governance quality indicators and savings

	(1)	(2)	(3)	(4)	(5)	(6)
	RL	**RL**	**GE**	**GE**	**VA**	**VA**
Long-run						
Remittances (REM)	0.010	0.036	−0.033	−0.086***	0.088***	0.088***
	(0.027)	(0.029)	(0.029)	(0.031)	(0.026)	(0.023)
Foreign Aid	0.082***	0.071***	0.018*	0.021***	0.020	0.007
	(0.021)	(0.020)	(0.010)	(0.008)	(0.015)	(0.013)
FDI	−0.155***	−0.126***	−0.153***	−0.134***	−0.023	−0.036**
	(0.024)	(0.023)	(0.023)	(0.024)	(0.020)	(0.018)
DIR	−0.000	−0.002	0.002	0.005	0.000	0.002
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
IR	0.001	0.002	0.004	0.009***	0.005*	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
GDP	1.112***	1.049***	1.147***	1.244***	0.943***	0.928***
	(0.048)	(0.048)	(0.048)	(0.046)	(0.047)	(0.040)
RL	0.013***	0.014***				
	(0.002)	(0.002)				
REM × RL		−0.020				
		(0.019)				
GE			−0.338***	−0.484***		
			(0.067)	(0.084)		
REM × GE				0.006		
				(0.028)		
VA					0.036	0.021
					(0.063)	(0.063)
REM × VA						−0.070***
						(0.016)
Speed of adjustment						
ECT	−0.370***	−0.383***	−0.408***	−0.400***	−0.459***	−0.486***
	(0.080)	(0.078)	(0.094)	(0.110)	(0.077)	(0.084)
Short-run						
Remittances (REM)	0.223**	0.103	0.178*	0.181*	0.263***	0.335**
	(0.092)	(0.127)	(0.095)	(0.107)	(0.095)	(0.130)
Foreign Aid	−0.016	−0.016	0.009	0.017	0.006	0.003
	(0.030)	(0.031)	(0.029)	(0.027)	(0.020)	(0.017)
FDI	0.077	0.065	0.084	0.074	0.040	0.031
	(0.070)	(0.066)	(0.061)	(0.055)	(0.039)	(0.045)
DIR	0.034*	0.031	0.039*	0.038*	0.028	0.030
	(0.020)	(0.020)	(0.022)	(0.023)	(0.020)	(0.021)
IR	−0.011*	−0.011*	−0.009*	−0.012**	−0.008**	−0.007*
	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)

(*Continued*)

Table 14 Continued

	(1)	(2)	(3)	(4)	(5)	(6)
	RL	**RL**	**GE**	**GE**	**VA**	**VA**
GDP	1.568***	1.574***	1.476***	1.544***	1.192***	1.386***
	(0.451)	(0.473)	(0.401)	(0.400)	(0.337)	(0.384)
RL	0.002	0.001				
	(0.006)	(0.006)				
REM × RL		−0.188**				
		(0.084)				
GE			0.177	−0.207		
			(0.143)	(0.241)		
REM × GE				0.085		
				(0.131)		
VA					0.178**	0.018
					(0.074)	(0.210)
REM × VA						−0.162
						(0.131)

Notes: The Hausman test with a *p*-value greater than 5% informed the choice of PMG over the MG estimator; SEs in parentheses; Total observations (*N*) are 357.

Source: Author calculations.

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

DIR, deposit interest rate; ECT, error correction term; FDI, Foreign Direct Investment; GDP, gross domestic product; GE, government effectiveness; IR, inflation rate; MG, mean group; PMG, pooled mean group; RL, rule of law; SEs, standard errors; VA, voice and accountability.

clearly effective in inducing savings as the observation of PR, a similar case holds for CL in the short-run. By implication, higher institutional quality in terms of PR compliment remittance inflows to propel savings. In the LAC region, therefore, the impact of remittances on savings also depends on the enabling political, economic, and legal environment.

On the issue of macroeconomic environment, the results as presented in Table 15 are equally informative. An inflationary environment would render the role of remittances in savings disastrous. The coefficient of the interaction term (REM × INF) is negative and highly significant at 1%, implying that inward remittances are more effective in inducing savings in a stable macroeconomic environment. In that case, higher inflation would be deemed distortionary to remittance inflows' contribution to boost savings. In other words, macroeconomic stability in terms of moderate inflation is crucial if migrant transfers are to enhance the saving culture. Likewise, our earlier hypothesis that other forms of foreign capital are essential in the remittance–savings relationship finds support in this study, but only in the long-run. Intuitively, there is a complementary role between either remittances and foreign aid or remittances and FDI in driving savings. By implication, both foreign aid as well as FDI can go a long way in catalyzing migrant transfers to achieve the savings motive. A positive and significant coefficient of the relevant interaction terms observed here implies that remittances are more effective in inducing savings in countries with increasing aid and FDI. Thus, the marginal importance of remittances as a financial source for savings increase with improved flow of

Table 15 Interaction effects of foreign capital and macroeconomic environment on savings

	(1)		(2)		(3)	
	REM × AID		**REM × FDI**		**REM × INF**	
Long-run						
Remittances (REM)	0.789***	(0.068)	0.559***	(0.048)	0.830***	(0.062)
Foreign aid (AID)	−0.175***	(0.028)	−0.082***	(0.031)	−0.112***	(0.030)
FDI	0.015	(0.026)	0.269***	(0.021)	0.112***	(0.025)
DIR	−0.018***	(0.005)	−0.033***	(0.005)	−0.047***	(0.007)
Inflation rate (INF)	0.011**	(0.005)	0.023***	(0.005)	−0.011	(0.008)
GDP	0.117***	(0.009)	0.108***	(0.009)	0.065***	(0.010)
REM × AID	0.051***	(0.014)				
REM × FDI			0.098***	(0.010)		
REM × INF					−0.0425***	(0.006)
Speed of adjustment						
ECT	−0.233***	(0.038)	−0.252***	(0.047)	−0.248***	(0.047)
Short-run						
Remittances	0.002	(0.163)	0.292*	(0.171)	0.066	(0.127)
Foreign aid	0.086	(0.066)	0.024	(0.021)	0.042***	(0.016)
Inward FDI	0.030	(0.035)	0.125	(0.096)	0.015	(0.025)
DIR	0.025*	(0.015)	0.034	(0.024)	0.016	(0.011)
IR	−0.012*	(0.007)	−0.010**	(0.005)	−0.073	(0.054)
GDP	0.009**	(0.004)	0.006	(0.004)	0.011***	(0.004)
REM × AID	−0.069	(0.056)				
REM × FDI			−0.036	(0.053)		
REM × INF					−0.008	(0.022)
Observations	357		357		357	

Notes: The Hausman test with a *p*-value greater than 5% informed the choice of PMG over the MG estimator; SEs in parentheses.

Source: Author calculations.

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

DIR, deposit interest rate; ECT, error correction term; FDI, foreign direct investment; GDP, gross domestic product; IR, inflation rate; MG, mean group; PMG, pooled mean group; SEs, standard errors.

foreign aid and FDI in the long-run. The finding is in line with Baldé (2011) and Laniran and Olakunle (2019). Therefore, it can rightly be argued that inward remittances can complement the foreign aid and inward FDI but cannot replace them in orchestrating economic development through savings.

Finally, the introduction of FC dummy in the remittance–savings model in Table 12, Column (7), makes the relevant coefficient on the remittances weakly significant in the long-run. The observation here is that the direct effect of the global financial shock on savings was negative and highly significant at a 1% statistical level. The relevant coefficient (−0.173) implies that an increase in the FC by 1 year would lead savings to decrease by about 17.3%, other factors constant. However, the interaction term involving remittances and FC [Column (8)] produces a coefficient that is statistically positive, implying that the role of inward remittances in savings

is felt much more during times of high FC. The relevant coefficient is statistically significant at 1%, suggesting that migrant transfers mitigate the adverse effects of the FC on savings. By implication, remittances are a lifeline to savings in periods of crisis, and this is reflective of their countercyclical nature. The findings could also be supportive of the previous documentation in Nnyanzi (2013) that reveals the remittance channel as a significant shock absorber that could reduce income risk by about 27% via its provision of financial resources to the recipients when a country is hit by a shock.

4.4 **Additional findings**

Although the overall remittance effect on savings is significantly positive for the LAC region as a whole in the long-run, differential effects surface when we consider country-specific results in Table 16 in the short-run. While the effect is observed positively significant for only Bolivia, Brazil, Dominican Republic, Guatemala, and Nicaragua, there is a deleterious effect of the same on savings in Mexico, Panama, and Paraguay.

In all the rest of the countries, we fail to find evidence of any significant remittance effect on savings in each of those economies. In contrast, the positive aid effect on the saving behaviors in Brazil, Honduras, and Nicaragua is significantly traceable in the data, while FDI is only found to positively influence savings in Guyana, Peru, and Guatemala, but only strongly significant for the latter. These findings are comparable to an earlier study by Munir et al. (2011) for Pakistan. On the other hand, while interest rates are found positively linked to savings for Haiti, Paraguay, Panama, and Peru, with the relevant coefficients significant at 1% for the latter three and 10% for Haiti, an inverse relationship appears between DIR and savings for Brazil (at 1% significance level) and Chile (at 10% significance level). Similarly, inflation is found significantly dangerous to savings for Argentina, Guatemala, and Peru. Finally, further evidence provided in Table 16 points to the positive role of economic development to savings in the majority of the LAC countries. In essence, the differential impacts of the various factors aforementioned on savings is an indication of the heterogeneous nature of the LAC countries. Moreover, this may be less surprising since policy responses vary from country to country. It was on the basis of this heterogeneity that the study adopted the ARDL approach using the PMG estimator well-suited for such samples.

In line with our expectations, the ECT is everywhere negative and significant, implying long-term adjustment, and thus, an indication of the presence of a long-run causal relationship between model variables. Specifically, for example, after computing the duration for adjustment from the disequilibrium state to a steady-state ($1/\text{ECT} \times 100$), the result shows that it takes the model a time period of about 2 years and 3 months [i.e., $1/0.430 = 2.3$, Table 11, Column (2)] to adjust back to the equilibrium state.

4.5 **Robustness check**

As a way to check for the sensitivity of our results to alternative estimation techniques, we separately estimated the cointegrating coefficients by the augmented mean group (AMG) estimator, introduced in Eberhardt and Teal (2010) and Bond and Eberhardt (2009), which regards heterogeneity and cross-sectional dependency. AMG approach allows for unbiased estimations in the presence of cross-sectional dependency or no cross-sectional dependency. However, the

Table 16 Remittances and savings – PMG results for full sample (individual countries) – NEW

	(1) ECT	(2) REM	(3) AID	(4) FDI	(5) DIR	(6) INF	(7) GDP
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Argentina	−0.977***	−0.004	0.021	0.058	−0.002	−0.028**	−0.057
Belize	−0.074	0.374	−0.044	0.042	0.090	−0.017	5.814*
Bolivia	−0.521***	0.161*	−0.074	−0.001	0.001	−0.009	2.627***
Brazil	−0.308***	0.224***	0.076***	−0.036	−0.012***	0.000	1.027***
Chile	−0.087	0.015	−0.005	−0.009	−0.012*	0.004	1.285***
Colombia	−0.158*	−0.043	0.007	0.018	−0.004	0.006	0.916***
Costa Rica	−0.516***	−0.004	0.023	−0.079	0.010	−0.004	1.078**
Dominican Republic	−0.361***	1.050***	0.014	0.006	−0.003	−0.002	0.276
Guatemala	−0.433***	0.367***	−0.007	0.030***	0.004	−0.020***	0.630**
Guyana	−0.98***	0.776	−0.205	0.674*	0.289	−0.045	0.581
Haiti	−0.676***	0.164	−0.000	0.024	0.026*	−0.002	0.425
Honduras	−0.473***	0.177	0.182*	0.019	−0.037	0.000	1.534*
Mexico	−0.796***	−0.215**	−0.010	−0.029	0.009	−0.005	0.453**
Nicaragua	0.048	0.814**	0.158*	0.051	−0.028	−0.003	2.007***
Panama	−0.251**	−0.078*	−0.016	−0.013	0.076***	0.012	1.583***
Paraguay	−0.590***	−0.209*	−0.031	0.004	0.027***	−0.005	0.873***
Peru	−0.360***	−0.133	0.001	0.031*	0.033***	−0.011**	1.321***
Long-run							
N=357		0.080***	0.012	−0.044*	0.001	0.003	0.958***

Notes: The Hausman test (not shown here) with a *p*-value greater than 5% informed the choice of PMG over the MG estimator; MG results are available on request; GDP is GDP per capita income; SEs not shown.

Source: Author's computations.

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

AID, foreign aid; Coeff., coefficient; DIR, deposit interest rate; ECT, error correction term; FDI, foreign direct investment; GDP, gross domestic product, INF inflation; MG, mean group; PMG, pooled mean group; SEs, standard errors.

results obtained are exactly similar to the ones from PMG estimator. Similarly, Pesaran's (2006) Common Correlated Effects Mean Group (CCE) estimator, which corrects for possible correlations across countries due to common shocks on top of allowing for heterogeneous slopes, is also estimated but results never substantially differ. Other panel data techniques employed also include the MG and DFE estimators. (Although the results are not presented here to save space, they are available on request.) Note that all these are designed for moderate T, moderate N macro panels, where moderate typically means from around 15 time-series/cross-section observations. In our case, T = 22 and N = 17.

It could be argued that the findings are majorly driven by Mexico, one of the top recipients of remittances in the developing region for the last 5–10 years, coming only third (US$36 billion) after India (US$79 billion) and China (US$67 billion) in 2018, and still in third position in 2019 with US$38.5 billion, after China (US$68.4 billion) and India (US$83.1 billion). We tested this possibility by temporarily dropping the country (Mexico) from the sample, but the findings remained robust.

5 Conclusion

We set out to investigate both the direct as well as the indirect role of migrant transfers on the saving behaviors of the LAC countries during the period 1997–2018. Using the ARDL panel estimation technique, the results based on the PMG approach provide strong evidence to our hypotheses. On average, an increase in inward remittances by 1% would lead to about 0.10% increase in savings after controlling for income, interest rates, and inflation, but the effect is quantitatively larger in the short-run than in the long-run. Moreover, we observe a detrimental role of remittances on savings in the long-run once governance quality in aggregate and disaggregated forms are controlled for. These adverse effects could spill over to economic development since savings are a lifeline to economic growth. Macroeconomic stability as well as sound institutional quality and alternative forms of foreign capital are found to be important moderators of the remittance–savings linkage. Also notable is that remittances appear to perform better in mitigating the adverse effects of poor institutional quality on savings, particularly in the long-run, where CC, RQ, and VA are still wanting. Nevertheless, an environment where corruption is highly controlled is found to bleed greater remittance benefits to savings in the short-run. Similarly, higher institutional quality in terms of PR in the long-run, and CL in the short-run, complement remittance inflows in propelling savings to Latin America and the Caribbean countries. On the other hand, the remittances play a major role in ameliorating the adverse effects of the FC on savings, just as they are observed to function as a lifeline to savings in countries with increasing macroeconomic instability in form of inflation, in the long-run. Finally, the study findings reveal the importance of other forms of foreign capital (i.e., foreign aid and FDI) in the remittance–savings linkage, implying a complementary role of migrant transfers rather than a substitute to AID or FDI. This is an important finding given that remittances are private flows, not directly intended to fund infrastructure development but also subject to fluctuations and the Dutch-disease effect. Therefore, misguided policies that promote these migrant transfers at the expense of other forms of foreign capital would be disastrous to economic development. The findings are robust to the use of alternative estimation techniques and with respect to alternative definition of savings. In a nutshell, while remittances are a blessing and not a curse for savers in the LAC countries, there is need for caution in promoting the same, especially given our finding that once governance quality is controlled for, the inward remittances appear detrimental to savings in the region in the long-run, albeit helpful in the short-run.

In order to maximize the saving impact of remittances, promoting other forms of capital such as official development aid and FDI would be in order, and hence the need for an integral approach. Nevertheless, specifically for remittances, there is an urgent need to support cautious policies directed toward the promotion of remittance inflows to the region, including but not limited to incentives to attract migrant transfers into local savings funds; and, policies for support of the 'Remittances and Savings Program' initiated by the Multilateral Investment Fund (MIF), seeking to increase the access and use of formal savings products among remittance-sending and -receiving households in the LAC region. In light of the United Nations sustainable development goals (SDGs), particularly SDG 10, on migration, the need to reduce the cost of remittance transfers within 3% of total transaction value by 2030 is a means of substantially increasing disposable income for remittance-receiving families. Additionally, a

further expansion of mobile technology could help squeeze remittance costs and consequently boost the savings share of remittances to help the recipients acquire a greater ability to deal with the uncertainty in their lives by increasing their savings. The findings call for policies to further enhance institutional quality and promote inward FDI and development aid, as well as maintaining a stable macroeconomic environment in the effort to boost savings through remittances. An integral approach to support both inward remittances (private flows from migrants) as well as other forms of capital in invigorating savings is critical, especially given that the former may not directly be utilized for public infrastructural development. We concur with Merler (2018) that lower transaction costs and better access to financial services by immigrants should represent a key element of any policy to encourage remittances and in turn savings.

Overall, the study observation that remittances have a strong relationship with savings would imply that they indirectly act as channels of growth through savings. For, if savings are critical for investment and growth, then it is logical to argue that remittances that positively and significantly drive savings would by transitivity be important for growth. Nevertheless, further studies would perhaps be directed to investigating this possible dynamic linkage. It would also be interesting for future research to analyze in greater depth the remittance–governance–savings linkage using all countries if the objective changes. We limited ourselves to the LAC countries, as justified on account of the sizeable amount of remittances received relative to other regions among the developing countries as well as low savings observed. Moreover, many countries still lack data on the other variables we include in the model, albeit having data on institutions. We suggest it as a future study possibility once data for all countries on the relevant variables are available.

Declarations

Availability of data and material

The data employed is freely available online from the respective sources as indicated in the data section.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

JBN initiated the problem, performed detailed literature review, analyzed and interpreted the data. NK read and edited the manuscript in addition to contributing to the analysis and discussion. JBO worked on the methodology and the theoretical review. All authors read and approved the final manuscript.

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