Current account sustainability and capital mobility in Latin American and Caribbean countries

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Abstract: This study examines two issues, namely, the degree of current account deficit (CAD) sustainability and the degree of capital mobility in 24 Latin American and Caribbean countries and three regional agreements: Andean Community, MERCOSUR and SICA. To this end, the paper investigates the long-run relationship between saving and investment along with short-run dynamics by applying common correlated effects mean group (CCEMG) estimator to a panel error-correction model. Findings indicate that CAD is weakly sustainable in the Latin American and Caribbean region, MERCOSUR, and SICA while it's strongly unsustainable in the Andean Community. The sub-period analysis reveals that CAD has been adversely affected by the 2008 crisis. However, in the post-crisis period, CAD has been slowly decreasing in the Latin American and Caribbean region and Andean Community whereas it has continued increasing in MERCOSUR and SICA. Further, the estimates of error-correction terms and short-run coefficients indicate that the Andean Community and MERCOSUR observe higher degree of long-run and short-run capital mobility than SICA. Finally, the study provides policy implications.

Keywords: Saving-investment relationship, Capital mobility, Feldstein-Horioka puzzle, Current account sustainability, CAD, CCEMG, Panel cointegration, Latin America and the Caribbean.

JEL Classification: C30, F21, F32, F34, F40.

1. Introduction

Current account deficit (CAD) and capital mobility carry fundamental implications for policy-making processes, investment decisions, and financial stability. Notwithstanding large current account deficits, in a country with perfect capital mobility, the government would not be concerned with crowding out private investment by pursuing an expansionary fiscal policy. However, in a country with imperfect capital mobility, a persistent current account deficit may indicate the government's inability to manage the economy and may, consequently, lead to a sudden capital flight. Moreover, in a country with low capital mobility, a currency crisis may occur due to a rising current account deficit (Edwards 2001). Therefore, both current account deficit sustainability and capital mobility have spurred interest in both academic and policymaking circles. Surprisingly, none of the existing studies have analyzed these two economic phenomena together. Most of them either investigate the extent of current account deficits sustainability (Yol 2009; Chen 2011a, 2011b; Murat et. al 2014; Sing 2015; Dissou and Nafie 2019; Dash 2020) or analyze the degree of capital mobility (Narayan and Narayan 2010; Bangake and Eggoh 2011; Kumar and Rao 2011; Ketenci 2012; Drakos et. al 2017; Beck and Stanek 2019; Beck 2020). This paper takes a step further by investigating the degree of capital mobility and current account deficit sustainability within one empirical framework. To this end, the paper utilizes an alternative definition of the current account as the difference between domestic saving and domestic investment, CA= S - I, and constructs an error-correction model (ECM) based on famous Feldstein and Horioka's empirical framework for measuring capital mobility (Feldstein and Horioka 1980). In a new model, current account deficit sustainability is tested by conducting cointegration analysis between domestic saving and domestic investment; if the two variables form a cointegrating relationship being (1; -1), then CAD is strongly sustainable; otherwise, one can claim that CAD is weakly sustainable or

unsustainable. Furthermore, short- and long-run capital mobility is assessed using short-run saving-retention coefficients and error-correction terms, respectively.

The goal of this paper is to estimate and analyze the degree of current account sustainability and capital mobility in three Latin American and Caribbean integration blocs: Andean Community, MERCOSUR, and SICA which are characterized by different levels of economic integration. The former two are customs unions whereas the latter one is a free trade area (FTA). The study contributes to the existing literature in four ways. First, the paper strives to compare three trading blocs in terms of CAD sustainability and capital mobility and provide appropriate policy implications. Second, an alternative framework is utilized to estimate and analyze CAD sustainability along with capital mobility. A new framework involves estimating a cointegrating relationship between domestic saving and investment instead of conducting unit root testing of current account deficit or cointegration analysis of imports and exports. Third, the paper employs recently developed Common Correlated Effects Mean Group (CCEMG) estimator of Pesaran (2006). The estimator has two obvious advantages over other panel estimators. First, it accounts for cross-sectional dependence by introducing cross-sectional averages of both dependent and independent variables as additional regressors. Second, it accounts for potential heterogeneous dynamics in the short-run by letting short-run coefficients vary across cross-sectional units. And finally, the study conducts sub-period analysis to investigate how current account sustainability and capital mobility have been changing over time.

Following key findings emerge from the study. First, current account deficit is found to be weakly sustainable in the Latin American and Caribbean region, MERCOSUR, and SICA whereas it is strongly unsustainable in the Andean Community. Second, MERCOSUR is characterized by the highest degree of current account sustainability out of the three analyzed integration blocks. Third, the results indicate that Andean Community and MERCOSUR observe higher extent of long-run and short-run capital mobility than SICA. And finally, the sub-period analysis reveals that the pre-crisis period is characterized by increasing current account sustainability, which is then followed by a significant decrease in the degree of current account sustainability. In the post-crisis period, CA sustainability has been slowly recovering in Latin American and Caribbean region along with the Andean Community while it continues decreasing in MERCOSUR and SICA.

The remainder of the study is organized as follows. Section 2 presents a brief overview of related literature. Section 3 introduces the econometric methodology and describes the data set used for estimation. Section 4 reports estimation results including sub-period analysis and policy implications. Section 5 concludes the study.

2. Literature Review

2.1. Current account deficit sustainability

According to Taylor (2002), current account is sustainable when the economy can satisfy its intertemporal budget constraint or, econometrically, when current account is stationary, while inability to meet intertemporal budget constraint is equivalent to non-stationary current account. There are two approaches commonly used in the existing literature to test the sustainability of the current account balance. The first approach is based on conventional unit root testing of the current account deficit. Trehan and Walsh (1991) argue that the stationarity of CAD is a sufficient indicator of current account sustainability. Wu (2000) applies the panel data unit root test of Im et. al (1997) to examine the CA sustainability in 10 OECD countries. The results reveal that current account balances are sustainable in major industrial countries. Dulger and Ozdemir (2005) employ Robinson's (1994) technique for testing unit roots in the current account deficits of G7 countries. The results reveal that current account is unsustainable in all the countries. Christopoulos and León-Ledesma (2010) assess the sustainability of the US current account deficit by the means of linear and non-linear unit root tests. Their results imply that CAD is stationary, and the US meets its intertemporal budget constraint. Chen (2011a) runs the Markov switching unit root regressions for 8 OECD countries and find that CADs are unsustainable in all the 8 countries except for Belgium. Similarly, Chen (2011b) analyses the CA sustainability in the

group of G7 countries and obtains mixed results. Current accounts are found to be sustainable in Germany and Japan, whereas they are found to be no longer sustainable in Canada, France, Italy, UK, and US. However, the unit root testing approach has been criticized on the grounds that if CAD is found to be non-stationary, it might lead to wrong conclusions of unsustainable current account. Moreover, unit root tests only indicate if CAD is stationary (sustainable) without measuring the extent of sustainability, whether CAD is weakly or strongly sustainable (Dash 2020).

The second approach is based on cointegration analysis between exports and imports. Husted (1992) shows that if the two series are found to be non-stationary and form the cointegrating vector being (1, -1), then the current account is sustainable. Husted (1992) examines the long-run relationship between US exports and imports for the period 1967-1989. The results indicate that exports and imports are cointegrated and, consequently, the CAD is sustainable. Apergis et. al (2000) analyze the CA sustainability in Greece, using cointegration tests with and without structural breaks. The cointegrating coefficient is found to be 1, implying that CAD in Greece is strongly sustainable. Wu et. al (2001) employ cointegration technique by Johansen (1995) and DOLS estimator to analyze the cointegrating relationship between exports and imports in the panel of G7 countries. The authors estimate that the cointegrating coefficient is 1, implying that CAD is sustainable. Similarly, Irandoust and Ericsson (2004) employ cointegration techniques of Johansen (1988) and Johansen and Juselius (1990) to analyze the cointegrating relationship between exports and imports in France, USA, UK, Sweden, Italy, and Germany. Their results indicate that most countries are characterized by sustainable current account balances.

Recently, Dash (2020) has pointed out that one of the major limitations of the extant literature is that it overlooks the dynamics of CA adjustment. To overcome this limitation, Dash (2020) employs Pooled Mean Group (PMG) estimator of Pesaran et. al (1999) which allows to estimate short-run and long-run dynamics along with error correction coefficients. The estimation results reveal that imports and exports are cointegrated and current account deficits are weakly sustainable in all the analyzed samples. However, one of the main shortcomings of Dash (2020) is related to PMG estimator's limited estimation power in the presence of cross-sectional dependence. For instance, Gnimassoun and Coulibaly (2014) employ both a first-generation IPS unit root test suggested by Im et. al (2003) and the cross-sectionally augmented version of the IPS test (CIPS) developed by Pesaran (2007), where the former assumes cross-section independence and the latter relaxes the assumption of cross-section independence. The authors also utilize Pesaran's (2004) test for cross-sectional dependence which rejects the null hypothesis of cross-sectional independence in the sample of Sub-Saharan African countries. The results of the unit root testing reveal that CAD stationarity is accepted by IPS whereas CAD non-stationarity cannot be rejected by CIPS, implying that IPS test results might be spurious. Thus, this study accounts for cross-sectional dependence by applying CCEMG estimator which produces efficient and consistent estimates in the presence of cross-sectionally dependent residuals. Similar to PMG estimator, CCEMG estimator also allows to analyze the dynamics of current account adjustment by estimating both short-run and long-run coefficients along with error-correction terms.

Despite a large amount of literature on CAD sustainability in developed economies, emerging economies have hardly received any attention in the extant literature. Moreover, there are a few studies on CAD sustainability in Latin American and Caribbean countries (Chortareas et. al 2004; Holmes 2006; Kalyoncu and Ozturk 2010; Donoso and Martin 2013). Chortareas et. al (2004) employ non-linear unit root techniques to analyze sustainability in the debt of 12 Latin American countries. The authors obtain the results which confirm the existence of CAD sustainability in analyzed countries. Similarly, Donoso and Martin (2013) utilize non-linear unit root tests to investigate whether current account is mean reverting in 18 Latin American countries. The estimates reveal that current account is sustainable in 14 out of 18 countries. Similar results are also obtained by Holmes (2006) who examines CAD sustainability by estimating ADF regressions within a seemingly unrelated regression (SURADF) framework for 16 Latin American countries. The results confirm the presence of sustainable current account in at least 12 countries. Reversely, Kalyoncu and Ozturk (2010) find little evidence in favor of CAD sustainability in 6 Latin American countries (except Peru). However, the following shortcomings

can be pointed out in the aforementioned studies. First, the studies employ only unit root testing, which may lead to wrong conclusions of unsustainable current account if the null hypothesis of non-stationary CAD is not rejected. Moreover, unit root tests only tell if current account deficit is stationary (sustainable) without measuring the extent of sustainability. Second, the studies analyze current account sustainability in individual countries and have failed to conduct panel unit root testing or(and) panel cointegration analysis, which provides more efficient and consistent estimation results. Furthermore, none of the above-mentioned studies have examined the issue of CAD sustainability in any of the existing Latin American and Caribbean integration blocks, including SICA, MERCOSUR, and Andean Community.

All the extant literature analyzes the issue of current account sustainability by examining stationarity properties of CAD or cointegrating relationship between exports and imports. However, none of them utilize an alternative definition of the current account as a difference between domestic saving and investment to assess the degree of current account sustainability. Thus, this study employs an alternative model which allows not only to examine the issue of CAD sustainability but also to measure the degree of capital mobility and to study the famous 'Feldstein-Horioka puzzle'.

2.2. Feldstein-Horioka Puzzle and Capital Mobility

In their seminal contribution, Feldstein and Horioka (1980) regress the ratios of domestic investment to GDP on the ratios of domestic saving to GDP to examine the degree of capital mobility in 16 OECD countries:

$$(I/Y)_i = \alpha_i + \beta(S/Y)_i + \varepsilon_i. \quad (1)$$

The authors argue that if capital mobility is perfect, domestic investment should be financed by foreign saving and, thus, the long-run saving-investment coefficient (also known as the Feldstein-Horioka coefficient), $\boldsymbol{\beta}$, should be zero or close to zero. However, if the coefficient is not statistically different from unity, one can argue that capital mobility is low. Contrary to their expectations of increased capital mobility associated with deregulation of financial markets and a wide-spread reduction in capital controls, the authors obtain saving-retention coefficients close to one, which indicate low degree of capital mobility. Their perplexing results have generated a large amount of related research and perpetual debate attempting to resolve the puzzle.

One of the most commonly accepted explanations for such a tight long-run relationship between saving and investment is related to the intertemporal approach to budget constraint. Since debt cannot explode, saving and investment move in the same direction in the long-run, whereas they are allowed to deviate in the short-run. Such deviations are dependent on the nature of shocks that affect the economy. Thus, the solvency constraint requires that the current account is a stationary process. Since current account is determined by the difference between national saving and investment, saving and investment should form a cointegrating relationship being (1; -1). Hence, the correlation coefficient reflects the degree of saving-investment cointegration rather than low capital mobility (Jansen 1997, 1998). The argument in favor of intertemporal budget constraint has been explored by Coakley et. al (1996). The authors consider the saving-investment relationship in 23 OECD countries over the 1960-1992 period and find that the two series cointegrate with a unit coefficient regardless of the extent of capital mobility. Similarly, Coakley and Kulasi (1997) find cointegration between saving and investment series using Maddison's (1992) data set. They interpret their results as evidence in favor of CA solvency rather than insignificant degree of capital mobility. Moreno (1997) also finds a strong relationship between saving and investment in the US and Japan. The author argues that the results indicate a binding solvency constraint rather than low capital mobility. Pelgrin and Schich (2004) employ a panel error-correction technique to assess the saving-retention relationship in 20 OECD countries. The authors confirm previous findings that there is a long-run association between saving and investment which is in line with a solvency constraint. Moreover, the authors find that error terms have decreased over time, which implies that the speed of convergence to the long-run equilibrium has decreased over the analyzed period, indicating some increase in the degree of capital mobility.

Similarly, Drakos et. al (2017) apply a panel error-correction estimation technique to 14 EU countries and find a relationship between saving and investment in the long-run, reflecting intertemporal budget constraint. The authors also confirm that the speed of convergence to the long-run equilibrium has been decreasing over time, implying some degree of capital mobility.

However, some studies fail to obtain a unit coefficient on the long-run relationship between saving and investment. Based on the previous discussion, one would expect such results to be interpreted as the lack of a binding condition for the current account. Instead, the studies interpret the long-run coefficient as an indicator of long-run capital mobility similar to Feldstein and Horioka (1980). For instance, Ketenci (2010) analyzes four different groups of developed countries – G7, EU15, NAFTA and OECD. The author estimates the long-run saving-retention coefficients of 0.22, 0.096 and 0.35 for OECD, EU15 and NAFTA, respectively, which the author interprets as high capital mobility in the long run, whereas the coefficient of 0.75 for G7 is interpreted as an indicator of low capital mobility. Bangake and Eggoh (2011, 2012) employ a PMG estimator to assess the degree of capital mobility in 37 African countries. The long-run coefficients are estimated to be within 0.29-0.46 range which the authors interpret as a relatively high degree of capital mobility in the long run. Similarly, Azali et. al (2014) apply a PMG estimator to a group of high-income, OECD and non-OECD countries. The coefficients are estimated to be 0.89; 0.93 and 0.16 for panels of high-income, OECD and non-OECD countries. The authors conclude that high-income and OECD countries observe lower capital mobility compared to non-OECD countries.

This study makes an attempt to clarify the confusing interpretation of the long-run saving-retention coefficient. To this end, the study employs an error-correction framework where long-run coefficients are interpreted as an indicator of current account sustainability whereas error-correction terms and short-run coefficients are interpreted as an indicator of the degree of capital mobility in the long run and short run, respectively.

Similar to the literature on CAD sustainability, most of the existing studies assess the degree of capital mobility and examine the validity of the Feldstein-Horioka puzzle in advanced economies. Some studies obtain low saving-investment coefficients, a sign of high capital mobility (Özmen and Parmaksiz 2003a, 2003b; Pelgrin and Schich 2004; Kumar et. al 2010; Narayan and Narayan 2010; Kumar and Rao 2011; Ketenci 2012; Costantini and Gutierrez 2013; Katsimi and Zoega 2016), whereas other studies find evidence in favor of low capital mobility, confirming the results of Feldstein and Horioka (1980) (Feldstein 1983; Golub 1990; Tesar 1991; Bovenberg and Gordon 1996; Olivei 2000; Kim 2001; Erden et. al 2009; Ketenci 2010; Chen and Shen 2015; Drakos et. al 2017; Beck 2019).

While most studies focus on developed economies, emerging or developing economies have been largely overlooked in the existing literature. Some studies analyze large samples of developing economies and obtain low saving-retention estimates, contradicting the puzzle (Kasuga 2004; Misztal 2011; Azali et. al 2014), whereas other studies find little evidence on high capital mobility in developing economies (Coakley et. al 1999; Isaksson 2001). Some authors examining East-Asian and African countries obtain no evidence of the puzzle by finding low or statistically insignificant long-run estimates (Cooray 2002; Narayan 2005; Payne and Kumazawa 2005; Guillaumin 2009; Bangake and Eggoh 2011; Wang 2013; Adams et. al 2016), while other authors confirm the Feldstein-Horioka puzzle by obtaining high saving-investment coefficients (Kim et. al 2005; Kim et. al 2007). Likewise, there are few studies on capital mobility and Feldstein-Horioka puzzle in Latina American and Caribbean countries (Rocha 2008; Murthy 2009; Cavallo and Pedemonte 2016; Kumar 2015). Rocha (2008) employs an error-correction framework to assess the degree of capital mobility in 12 Latin American countries over the period 1960-1996. The author finds evidence of an intermediate degree of capital mobility. Murthy (2009) assesses the degree of capital mobility in 19 Latin American and Caribbean countries over the period 1960–2002, employing the Pedroni panel Group FMOLS technique. Similar to Rocha (2008), the author confirms a moderate degree of capital mobility. Likewise, Cavallo and Pedemonte (2016) investigate capital mobility in 24 Latin American and Caribbean countries, employing the Pedroni panel Group FMOLS estimator. Their results confirm the previous findings of a moderate degree of capital mobility in the region. Kumar (2015) applies general to specific (GETS) method of

Hendry (1995) to assess the degree of capital mobility in various integration blocs, including MERCOSUR. The results reveal that capital mobility is relatively moderate in MERCOSUR. Similar to other literature on the Feldstein-Horioka puzzle, the aforementioned studies give a conflicting interpretation to the long-run saving-investment coefficient. The authors find that saving and investment series are cointegrated; however, the results are interpreted in terms of capital mobility rather than current account sustainability, which contradicts the solvency constraint theory. Furthermore, Murthy (2009) and Cavallo and Pedemonte (2016) utilize the Pedroni panel Group FMOLS estimator which has limited power in the presence of cross-sectional dependence. Moreover, none of the existing studies have analyzed the degree of capital mobility in SICA, and Andean Community. This study makes an attempt to fill the identified gaps in the existing literature.

3. Materials and Methods

3.1. Diagnostic testing

Before proceeding to panel cointegration analysis and panel estimation, the study conducts diagnostic tests. First, the residuals are checked for cross-sectional dependence and non-stationarity. CD statistic proposed by Pesaran (2014) is used for the former, and the CIPS test of Pesaran (2007) is applied for the latter. Additionally, individual unit root test developed by Clemente et. al (1998) is utilized to test for residual stationarity in the presence of one or two structural breaks.

Once the residuals are checked for cross-sectional dependence and stationarity, cointegration analysis is conducted in order to determine if a long-run relationship exists between saving and investment. In order to determine if saving and investment are cointegrated, this study utilizes Westerlund's (2007) four panel cointegration tests which allow to check for the presence of a cointegrating relationship in heterogenous panels. The tests account for structural rather than residual dynamics, which allows to avoid a common-factor restriction like in other cointegration tests. Additionally, a cointegration test developed by Gregory and Hansen (1996) is employed to test for cointegration between two series in the presence of a structural break.

3.2. Error-correction model

In the existing literature on CAD sustainability, most authors, that employ panel estimation techniques, use DOLS and FMOLS estimators to obtain coefficients on imports or 'sustainability coefficients' (Wu et. al 2001; Baharumshah et. al 2005). However, DOLS and FMOLS estimators have a serious limitation: they don't provide any information on the error-correction mechanism of the current account which shows the dynamics of the current account adjustment to its long-run equilibrium. Dash 2020 tries to overcome this limitation by estimating a panel error-correction model. To this end, the author employs the Pooled Mean Group (PMG) estimator of Pesaran et. al (1999) which allows to estimate short-run and long-run dynamics along with error correction coefficients. However, the main shortcoming of the Pooled Mean Group (PMG) estimator is its limited estimation power in the presence of cross-sectional dependence. Moreover, the extant literature analyses a cointegrating relationship between imports and exports whereas this study examines a cointegrating relationship between saving and investment. A new model allows to study long- and short-run capital mobility together with current account sustainability in the same framework.

If the residuals are cross-sectionally dependent, the traditional panel estimators lose their consistency and produce invalid estimation results. Cross-sectional dependence often arises due to the correlation between unobserved factors and the explanatory variable (Pesaran 2006). Pesaran (2006) has proposed a common correlated effects (CCE) estimator to deal with cross-sectional dependencies in heterogeneous panels. This paper employs the mean-group version of the CCE estimator which, additionally, accounts for potential heterogeneous dynamics in the short-run by letting short-run coefficients vary across cross-sectional units. Based on Feldstein and Horioka (1980) and Pesaran (2006), this study constructs a general model to evaluate the association between saving and investment:

$$(I/Y)_{it} = \alpha_i + \beta_i(S/Y)_{it} + u_{it}, \tag{2}$$

$$u_{it} = \gamma_i' \boldsymbol{f}_t + \varepsilon_{it}, \tag{3}$$

where $(I/Y)_{it}$ and $(S/Y)_{it}$ are gross capital formation as a share of GDP and gross domestic saving as a share of GDP respectively. $\boldsymbol{f}_t$ is the unobserved common factor and γ_i' is the heterogeneous factor loading. According to Pesaran (2006), consistent estimates can be obtained if the unobserved common factors, $\boldsymbol{f}_t$, are approximated by the cross-section means of investment, $\overline{I/Y_t}$, and saving, $\overline{S/Y_t}$. Consequently, $\tilde{\gamma}_i^{SY}\overline{S/Y_t}$ and $\gamma_i^{IY}\overline{I/Y_t}$, are the fractions of fully diversified individual saving and investment rates respectively. Thus, $((S/Y)_{it} - \tilde{\gamma}_i^{SY}\overline{S/Y_t})$ and $((I/Y)_{it} - \gamma_i^{IY}\overline{I/Y_t})$ are idiosyncratic saving and investment respectively. Using the information above, equation 2 can be re-written in the following way:

$$(I/Y)_{it} = \alpha_i + \beta_i(S/Y)_{it} + \gamma_i^{IY}\overline{I/Y_t} + \gamma_i^{SY}\overline{S/Y_t} + \varepsilon_{i,t}, \tag{4}$$

where $\gamma_i^{SY} = -\beta_i\tilde{\gamma}_i^{SY}$, γ_i^{IY} and γ_i^{SY} have no meaningful interpretation.

In order to estimate the short-run and long-run dynamics jointly, this study constructs the following error correction model:

$$\Delta(I/Y)_{it} = \lambda_i((I/Y)_{i,t-1} - \alpha_i - \beta_i(S/Y)_{i,t-1} - \sum_{l=0}^{p_T}\gamma_{i,l}^{LR}\bar{Z}_{t-l}) + \delta_i\Delta(S/Y)_{it} + \sum_{l=0}^{p_T}\gamma_{i,l}^{SR}\bar{Z}_{t-l} + \varepsilon_{it}\,, \tag{5}$$

where λ_i are the coefficients that measure the speed of adjustment of saving and investment to their long-run equilibrium or the measurement of long-run capital mobility, β_i is the measurement of current account sustainability, and δ_i is the measurement of short-term capital mobility. $\bar{Z}_t$, $\bar{Z}_t = (\overline{I/Y_t}, \overline{S/Y_t})$, includes the cross-sectional means of the gross capital formation as a share of GDP and gross domestic saving as a share of GDP. Since the lagged dependent variable is not strictly exogenous and is correlated with the error term, the estimate turns out to be inconsistent. However, according to Chudik and Pesaran (2015), the consistency is achieved when the number of cross-sectional means is set at $p_T = \sqrt[3]{T}$, which for this equation is equal to three, $p_T = \sqrt[3]{31} \approx 3$. The Mean Group estimators are obtained in the following way: $\hat{\pi}_{MG} = \frac{1}{N}\sum_{i=1}^{N}\hat{\pi}_i$ with $\hat{\pi}_i = (\hat{\lambda}_i, \hat{\delta}_i, \hat{\beta}_i)$.

Given equation 5, the steady-state equilibrium in country i is defined as:

$$\lambda_i((I/Y)_{i,t-1} - \alpha_i - \beta_i(S/Y)_{i,t-1} - \sum_{l=0}^{p_T}\gamma_{i,l}^{LR}\bar{Z}_{t-l}) = 0. \tag{6}$$

In case λ_i is found to be not statistically significant from zero, it can be ultimately concluded that there is no long-run association between saving and investment, which could be considered as evidence of high capital mobility across countries and unsustainable current account. However, if λ_i is estimated to be negative and statistically significant from zero, it can be concluded that the relationship between saving and investment exists in the long run. Depending on the size of λ_i, one can conclude about the degree of capital mobility in analysed samples. The closer λ_i to -1 is, the faster current account converges back to its long-run equilibrium and, consequently, the lower long-run capital mobility is. On the other hand, the closer λ_i to 0 is, the more slowly current account converges back to its long-run equilibrium and, consequently, the higher long-run capital mobility is.

β_i represent the degree of current account sustainability. There are two cases regarding the values of the long-term coefficients β_i. If $\beta_i = -1$, then current account is equal to $-\alpha_i$ in the long-run: $(CA/Y)_i = (S/Y - \alpha_i - I/Y)_i = -\alpha_i$. Saving and investment series form a cointegrating vector of (1, -1). Thus, current account is a stationary (sustainable) variable, fluctuating around its long-term value of $-\alpha_i$. If $\alpha_i = 0$, current account fluctuates around zero in the long run. Thus, one may conclude that the intertemporal budget constraint is binding in the long-run and current account is sustainable.

If $\beta_i \neq 1$, then current account is equal to $-\alpha_i + (1 - \beta_i)(S/Y)_i$. Therefore, saving and investment series form a cointegrating vector of $(1, -\beta_i)$. Consequently, current account is a non-stationary variable.

Depending on the size of β_i, one can conclude whether current account is weakly or strongly sustainable. The closer β_i to 1 is, the more highly sustainable current account is. Reversely, the closer β_i to 0, the more weakly sustainable current account is. If $\beta_i = 0$, one can conclude that current account is strongly unsustainable.

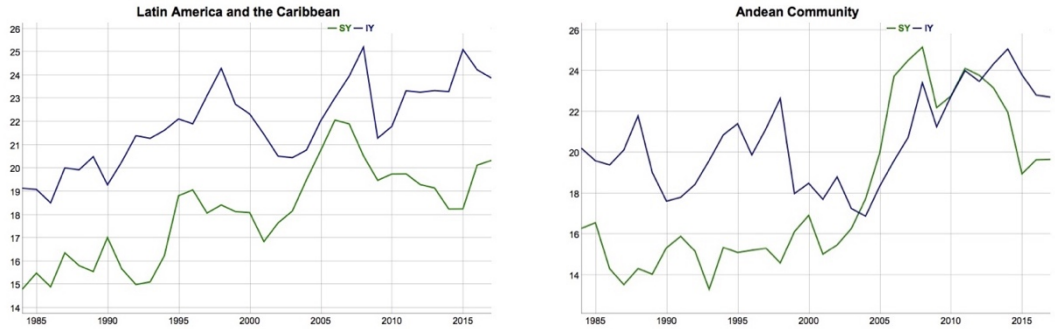
As for the short-term coefficients, δ_i, if they are estimated to be equal or close to zero, one could conclude that capital mobility is high in the short run. However, if the short-term coefficients are greater than zero, the degree of short-term capital mobility decreases with the increase in the value of δ_i.

3.3. Data description

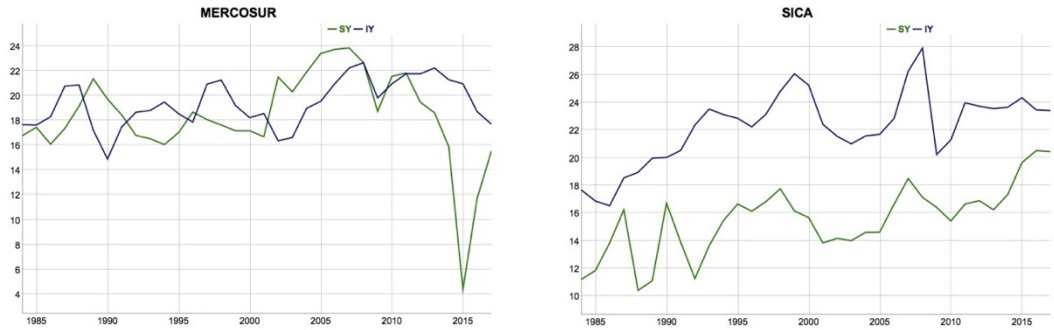
The data set consists of 24 Latin American and Caribbean countries spanning 1984-2017. The list of countries included in each individual data sample is presented in Appendix A. The data on both gross domestic saving as a percentage of GDP (S/Y) and gross investment as a percentage of GDP (I/Y) has been retrieved from the World Bank database - World Development Indicators. For the ease of reading, gross domestic saving as a percentage of GDP will be addressed as saving and gross investment as a percentage of GDP will be addressed as investment.

Figure 1 shows the average of gross domestic saving (S/Y) and gross investment (I/Y), expressed as a percentage of GDP, for four analysed data samples. Two conclusions can be drawn based on the graphs. First, the analysed samples are characterized by persistent current account deficits. Second, both the Andean Community and MERCOSUR have experienced the period of current account surplus prior to the financial crisis of 2008. However, in succeeding years, both samples have observed a drastic increase in the current account deficit.

Table 1 summarizes statistical properties of gross saving, investment and current account deficit (CAD), expressed as a percentage of GDP. Average saving and investment rates in the sample of the Latin American and Caribbean countries are 18.07% and 21.89%, respectively whereas the current account balance (% of GDP) is -3.83%. Trinidad and Tobago show the highest saving rate of 28.18%, while Panama shows the highest investment rate of 32.04%. Nicaragua shows the lowest saving rate of 9.47%, whereas El Salvador shows the lowest investment rate of 15.5%. The highest current account balance (% of GDP) of 6.29% is in Trinidad and Tobago, while the lowest current account balance (% of GDP) of -15.81% is in Nicaragua. Among three economic integration blocks, the highest saving rate of 18.31% is observed in MERCOSUR, whereas the highest investment rate of 22.21% is observed in SICA. The lowest saving rate of 15.52% is observed in SICA, while the lowest investment rate of 19.37% is observed in MERCOSUR. Consequently, MERCOSUR shows the lowest CAD (% of GDP) of -1.05%, whereas SICA shows the highest CAD (% of GDP) of -6.69%.



(**a**) (**b**)



(c) (d)

Figure 1. Average gross domestic saving and investment, as a percentage of GDP presented for (a) 24 Latin American and Caribbean countries; (b) Andean Community; (c) MERCOSUR; (d) SICA.

Table 1. Properties of saving, investment and CAD (% of GDP, period mean).

Country/Region	S/Y	I/Y	CAD/Y
Argentina	16.508	17.511	-1.003
Bahamas	24.607	26.625	-2.018
Belize	16.954	22.090	-5.136
Bolivia	15.031	16.762	-1.731
Brazil	16.978	19.349	-2.371
Chile	21.345	23.351	-2.006
Colombia	17.709	20.603	-2.894
Costa Rica	14.034	19.454	-5.419
Dominican Republic	17.206	21.701	-4.495
Ecuador	20.765	23.476	-2.711
El Salvador	13.085	15.501	-2.416
Guatemala	12.051	15.707	-3.656
Haiti	20.950	26.281	-5.331
Honduras	19.979	25.908	-5.929
Jamaica	17.935	23.895	-5.960
Mexico	20.883	21.668	-0.784
Nicaragua	9.472	25.285	-15.813
Panama	21.363	32.043	-10.679
Paraguay	20.928	20.890	0.038
Peru	18.415	21.383	-2.967
Santa Lucia	12.116	25.033	-12.917
Trinidad and Tobago	28.182	21.888	6.294
Uruguay	14.545	16.572	-2.027
Venezuela	22.628	22.509	0.119
Latin American and the Caribbean	18.069	21.895	-3.826
Andean Community	17.980	20.556	-2.576
MERCOSUR	18.317	19.366	-1.049
SICA	15.518	22.211	-6.693

4. Results and Discussion

4.1. Unit root testing and analysis of cross-sectional dependence

Table 2 reports the results of Pesaran's (2014) test for cross-sectional dependence (CD) along with the results of Pesaran's (2007) unit root test (CIPS). In all the four samples, CD statistic rejects the null hypothesis of weakly cross-sectionally dependent residuals and accepts the alternative hypothesis of

strongly cross-sectionally dependent residuals. Since residuals are found to be cross-sectionally dependent, second-generation panel unit roots test (CIPS) has been chosen over first-generation panel unit roots, which are based on the assumption of cross-sectional independence and, consequently, produce biased results if the assumption is violated. The CIPS test results indicate that the null hypothesis of a unit root cannot be rejected for both saving and investment in their levels, whereas no unit root has been detected in the first-differenced series. The obtained results indicate that saving and investment are integrated of order one, I (1), in their levels.

Table 2. Diagnostic tests for individual variables.

	S/Y	I/Y	$\Delta S/Y$	$\Delta I/Y$
Latin American and Caribbean countries				
CD-statistic	86.005***	93.731***	1.559	11.686***
$CIPS_{\mu}$	-2.217**	-2.286**	-2.902***	-2.660***
$CIPS_{\mu,t}$	-2.228	-2.360	-2.837***	-2.724**
Andean Community				
CD-statistic	13.621***	14.075***	1.933*	3.329***
$CIPS_{\mu}$	-1.890	-3.089***	-2.536**	-3.617***
$CIPS_{\mu,t}$	-2.310	-2.980**	-2.704	-3.505***
MERCOSUR				
CD-statistic	16.893***	18.084***	1.902*	4.539***
$CIPS_{\mu}$	-1.563	-2.323*	-2.851***	-2.224*
$CIPS_{\mu,t}$	-1.841	-2.049	-2.948**	-2.259
SICA				
CD-statistic	25.988***	29.914***	1.001	6.916***
$CIPS_{\mu}$	-2.685***	-1.922	-3.774***	-2.675***
$CIPS_{\mu,t}$	-2.632	-2.609	-3.670***	-2.659

1, 5 and 10% significance levels are denoted by ***, ** and *, respectively. Test for cross-sectional dependence (CD) follows a standard normal distribution and checks the null hypothesis of weakly cross-sectionally dependent errors. $CIPS_{\mu}$ (the model includes an intercept) and $CIPS_{\mu,t}$ (the model includes an intercept and trend) panel unit root tests check the null hypothesis of unit root against the alternative hypothesis of no unit root. The lag length for both tests is set at $T^{1/3} \approx 3$.

Unit root tests are also known to produce biased results in the presence of structural breaks. Thus, individual unit root test developed by Clemente et. al (1998) has been employed in order to check for a unit root in the presence of one or two structural breaks. The results are reported in Appendix B. Unit roots have been detected for all the countries with either single-break or double-break unit root tests in ether additive outlier (AO) or innovative outlier (IO) models. The only exceptions are Belize, Bolivia, Honduras, and Trinidad and Tobago, for whom neither of the tests and models have detected a unit root in the saving series, and Brazil, Colombia, Guatemala, Jamaica, and Peru, for whom no unit root has been found in the investment series. Additionally, the Clemente–Montanes–Reyes test has identified statistically significant structural breaks in both saving and investment series for all the countries. The shifts coincide with changes in political regimes, civil conflicts, replacement of national currencies, natural disasters, or military invasions. Like in the case of Argentina, structural breaks coincide with the precedency of Fernando de la Rúa in 1999-2001, which was characterized by a decrease in economic growth, capital flight, civil unrest, and bank runs (Galasso 2008), which could be accountable for the shift in national saving and investment. In Bolivia, the Clemente–Montanes–Reyes test has identified the structural break of 2003, when the Bolivian gas conflict broke out which led to president's resignation and nationalization of the gas sector (Bebbington and Bebbington 2010). In both Ecuador and El Salvador, structural shifts coincide with their decision to adopt US dollar as an official currency for transactions (Quispe-Agnoli and Whisler 2006). In Panama, 1988 and 1989 structural breaks coincide with the US invasion when the US military force entered the country in order to overthrow authoritarian military regime which existed in Panama since 1968 (Ropp 1992).

4.2. Cointegration Analysis

The overall results of unit root tests indicate that both saving and investment are non-stationary in their levels and are integrated of order one. Thus, the next step is to determine if the two series cointegrate. Table 3 reports the results of Westerlund's four panel cointegration tests results. The null hypothesis of no cointegration is strongly rejected for the overall sample of Latin American and Caribbean countries, MERCOSUR and SICA whereas in the Andean Community, the null hypothesis is rejected by P_τ- and G_α-statistics at 5% and 10% significance levels, respectively.

Table 3. Westerlund's panel cointegration tests results.

	Latin America and the Caribbean	**Andean Community**	**MERCOSUR**	**SICA**
Panel statistic				
P_τ-Statistic	-14.081***	-5.756**	-8.389***	-8.857**
P_α-Statistic	-13.911***	-11.725	-19.948***	-14.562***
Group-mean statistic				
G_τ-Statistic	-3.025***	-2.921*	-3.298***	-3.240**
G_α-Statistic	-14.702***	-11.959	-17.553***	-15.519**

1, 5 and 10% significance level are denoted by ***, ** and *, respectively. Each test equation includes an individual intercept and trend.

Since Clemente–Montanes–Reyes unit root tests have determined statistically significant structural breaks, the individual country Gregory-Hansen cointegration tests are employed to check if individual saving and investment series are cointegrated in the presence of structural breaks. The results are summarized in Appendix C. The estimated ADF statistics indicate that the null hypothesis of no cointegration is rejected in all countries expect for Jamaica, Paraguay and Peru. The overall findings of both cointegration tests strongly indicate that there is a long-run relationship between saving and investment in the presence of cross-sectional dependence and structural breaks.

4.3. Panel ECM results

CCEMG estimation results of panel error correction models are reported in Table 4. The estimates of the long-run coefficients (β) indicate that the intertemporal budget constraint is satisfied in the overall sample of Latin American and Caribbean countries, MERCOSUR and SICA, while the long-run coefficient is not statistically significant in the Andean Community, meaning that the intertemporal budget constraint is violated in the analyzed sample. In the long-run, one percentage increase in the domestic saving rate results into 0.52, 0.38, and 0.37 percentage points increase in the domestic investment rate in MERCOSUR, Latin America and the Caribbean, and SICA, respectively. Moreover, the long-run coefficients also indicate the degree of current account sustainability. The Wald test rejects the null hypothesis of the unit coefficient on saving in Latin America and the Caribbean, MERCOSUR and SICA. This implies that the current account deficit is weakly sustainable in the three samples for the estimated period. MERCOSUR shows the highest long-run coefficient of 0.52, indicating that its CAD is more sustainable compared to Latin America and the Caribbean and SICA. However, the long-run coefficient is not statistically different from zero in the Andean Community. This implies that the current account is strongly unstainable, suggesting that the member states run a high risk of exchange rate collapse and capital flight.

Table 4 also reports the estimates of the error correction terms (λ). The error correction term measures the speed of adjustment of saving and investment to their long-run equilibrium and the degree of long-run capital mobility. The estimated coefficients are all statistically significant and lie within the bound of 0 and -1. For Latin America and the Caribbean and the Andean Community, the coefficient of -0.47 indicates that 47% of the disequilibrium is corrected in the next year and it takes approximately 2 years for domestic saving and investment series to converge back to its long-run equilibrium. The coefficient of -0.38 indicates that the adjustment period is approximately 2.5 years in

MERCOSUR whereas the coefficient of -0.54 indicates that the adjustment period is around 2 years in SICA. The results suggest that domestic current account disequilibrium is sustained for a longer period in MERCOSUR than in two other integration blocks and the overall sample of Latin American and Caribbean countries. This implies that MERCOSUR member states observe the highest degree of capital mobility in the long run whereas SICA member states observe the lowest degree of capital mobility in the long run. Such results are in line with theoretical predictions that a customs union should observe a higher degree of capital mobility in the long run than a free trade area since the former one is characterized by a higher degree of economic integration.

The estimates of the short-run coefficients are presented in Table 4. The parameters are positive and statistically significant in Latin America and the Caribbean, MERCOSUR and SICA whereas the coefficient is statistically insignificant in the Andean Community. In the short-run, one percentage increase in the domestic saving rate results into 0.41, 0.25, and 0.12 percentage points increase in the domestic investment rate in SICA, the overall sample of Latin American and Caribbean countries, and MERCOSUR, respectively. This implies that MERCOSUR member states observe the highest degree of capital mobility in the long run whereas SICA member states observe the lowest degree of capital mobility in the long run. The short-run coefficient is not statistically different from zero in the Andean Community, implying that the member states observe perfect capital mobility in the short run. The aforementioned results confirm that short-run capital mobility should be higher in a more economically integrated customs union than in a less economically integrated free trade area.

The key findings from Table 4 are the following. First, current account deficit is weakly sustainable in Latin America and the Caribbean, MERCOSUR, and SICA whereas it is strongly unsustainable in the Andean Community. Second, the values of the long-run coefficients also indicate that MERCOSUR has the most sustainable current account balance out of the three analyzed integration blocks. The estimates of the error correction terms are negative and statistically significant. The results indicate that two customs unions – Andean Community and MERCOSUR – are characterized by higher long-run capital mobility than SICA (FTA), which is in line with prior expectations about the degree of capital mobility in trade blocs with different levels of economic integration. Third, short-run coefficients indicate that Andean Community and MERCOSUR observe a higher degree of capital mobility compared to SICA, which further confirms theoretical predictions about the difference in the extent of capital mobility in customs union and FTA.

Table 4. Estimation results of ECM with CCEMG.

	Latin America and the Caribbean		**Andean Community**		**MERCOSUR**		**SICA**	
	Value	*S.E.*	*Value*	*S.E.*	*Value*	*S.E.*	*Value*	*S.E.*
Long-run coefficient (β)	0.38***	0.13	0.23	0.32	0.52**	0.21	0.37***	0.11
Wald statistic ($\beta = 1$)	24.03***		5.91**		5.16**		34.31***	
Error-correction term (λ)	-0.47***	0.04	-0.47***	0.14	-0.38***	0.08	-0.54***	0.07
Short-run coefficient (δ)	0.25***	0.07	0.08	0.12	0.12*	0.07	0.41***	0.06
Intercept (a)	0.57	8.32	4.01	7.67	-12.05	15.62	-4.53	7.97
N of countries	24		4		5		8	

1, 5 and 10% significance level are denoted by ***, ** and *, respectively.

4.4. Results from sub-period analysis

This section provides sub-period regression results to assess how the degree of current account sustainability and capital mobility has changed over time. Figure 2 presents estimation results of ECM

with CCEMG with 20-year rolling windows. Panel A in Figure 2 reports results for Latin America and the Caribbean. The extent of current account sustainability, represented by long-run coefficients, is characterized by a high degree of fluctuation over the estimated period. It has been initially increasing in the period before the crisis of 2008 till it reached its peak in the period 1992-2011, which was followed by a sharp drop in the CA sustainability. Starting from the period 1996-2017, the long-run coefficient has been recovering over time and reached the value of 0.78 in the last period, indicating a relatively high degree of CA sustainability. The degree of long-run and short-run capital mobility, represented by error-correction term and short-run coefficient respectively, has remained stable over time. The average value of the error correction term fluctuates around -0.76, implying a relatively low degree of capital mobility in the long run. The mean short-run coefficient fluctuates around 0.22, suggesting a relatively high degree of short-term capital mobility.

The second panel in Figure 2 reports results for the Andean Community. The degree of current account sustainability has been increasing in the pre-crisis period. In the period 1990-2009, the long-run coefficient reached its peak, which was later followed by periods of gradual decreases and increases in the degree of CA sustainability. In 1997-2016, the coefficient reached the minimum of 0.22 and has been slowly recovering ever since. The degree of long-run capital mobility was initially high. However, starting from 1990-2009, it has rapidly decreased and remains around the value of -1, indicating a low degree of long-run capital mobility. The short-run coefficient remains stable, fluctuating around the average value of -0.05.

The next panel presents the results for MERCOSUR. Similar to the Andean Community, the extent of CA sustainability has been on a steady increase in the pre-crisis period. However, starting from 1994-2013, the degree of CA sustainability has been gradually decreasing. The degree of long-run capital mobility was initially decreasing, but starting from 1989-2008, it has been steadily increasing. The short-run coefficients indicate that the short-run capital mobility has been steadily increasing and remained relatively high throughout the estimated time period.

The results for SICA are summarized in the last panel of Figure 2. Like the Andean Community and MERCOSUR, the values of the long-run coefficients were slowly increasing in the pre-crisis period. However, since 1993-2012, the extent of CA sustainability has been decreasing over the remaining time period. In the end, the long-run coefficient remains around zero, indicating insignificant degree of CA sustainability. Similar to MERCOSUR, the long-run capital mobility was initially decreasing. However, starting from 1994-2013, it has been on a steady increase. Nevertheless, the error-correction term remains close to -1, indicating a low degree of long-run capital mobility. The short-run capital mobility was initially increasing till 1994-2013 when it reached its maximum, and it has been gradually decreasing ever since.

Overall, the results indicate that all the samples observe a gradual increase in the level of CA sustainability prior to the crisis 2008 which is then followed by a significant decrease in the degree of CA sustainability. In the post-crisis period, CA sustainability has been slowly recovering in Latin America and the Caribbean along with the Andean Community while MERCOSUR and SICA still observe a steady decrease. The long-run capital mobility has remained relatively low and stable in Latin America and the Caribbean over time. In the Andean Community, the extent of long-run capital mobility has been decreasing over time whereas it has been gradually increasing in MERCOSUR and SICA but remains relatively low. The degree of short-run capital in Latin America and the Caribbean and the Andean Community has been relatively high and stable over time whereas it has been steadily increasing in MERCOSUR and decreasing in SICA.

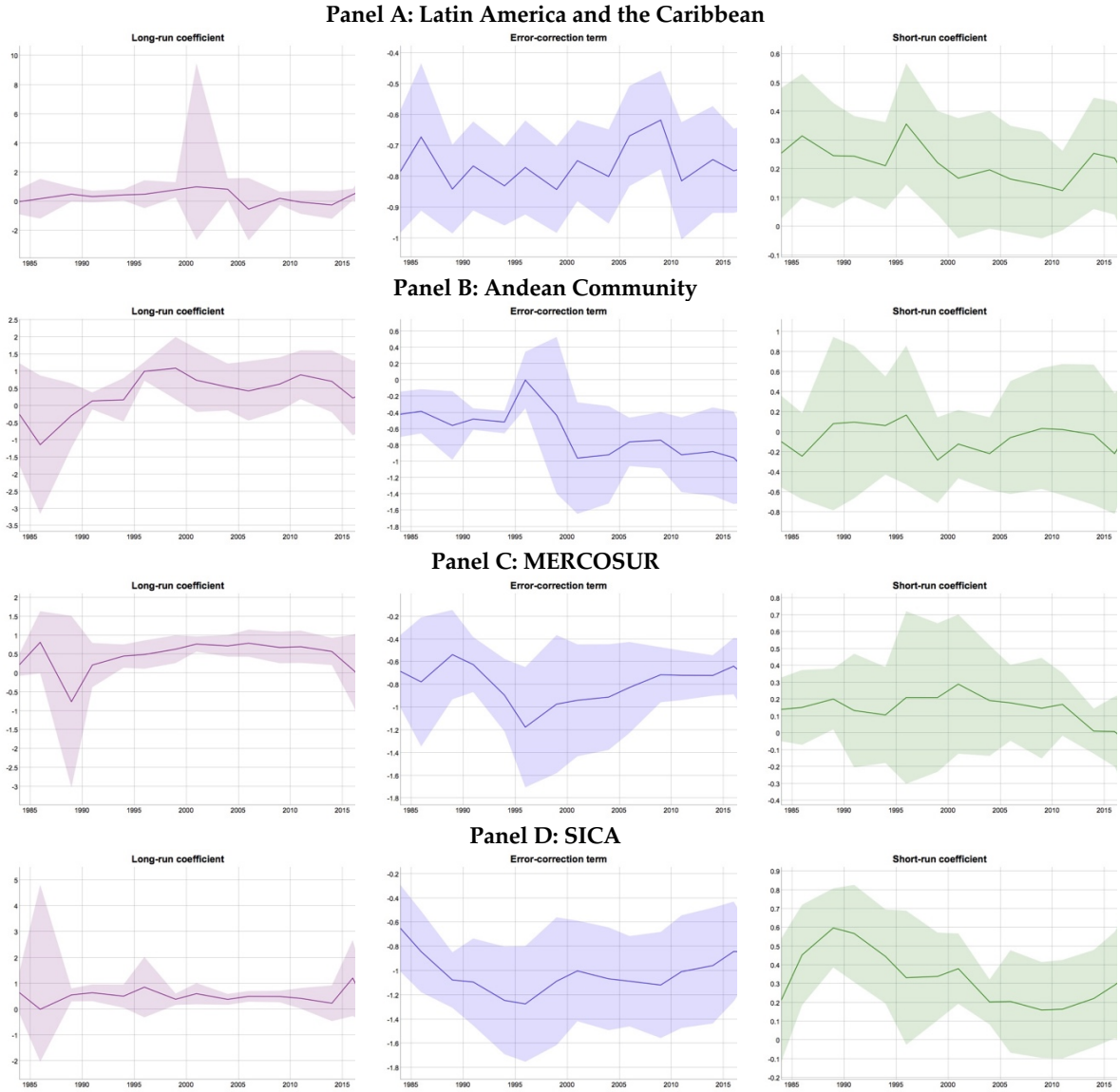


Figure 2. Sub-period analysis: 20-year rolling window regressions.

4.5. Discussion and policy implications

This study departs from the conventional estimation procedure used for assessing the degree of current account sustainability. Instead of analyzing a cointegrating relationship between exports and imports, this paper investigates a cointegrating relationship between saving and investment, which allows to assess the degree of both current account sustainability and capital mobility within the same framework. Further, this study utilizes an error-correction model to assess the long-run saving-investment relationship and short-run dynamics. There has been only one study so far which employs an error-correction model to investigate the short-run and long-run dynamics of the current account. Dash (2020) utilizes the PMG estimator to estimate an error-correction model for 30 Latin American and Caribbean countries. However, PMG estimator loses its consistency and produces invalid results in the presence of cross-sectional dependence. This study overcomes this limitation by employing CCEMG estimator which produces consistent results in the presence of cross-sectional dependence. Since this study uses different series to assess the degree of CA sustainability in the Latin American and Caribbean region, its results cannot be directly compared to those of Dash (2020). Nevertheless, both studies arrive at the same conclusion that current account is weakly sustainable in Latin America and the Caribbean.

The estimates of the long-run coefficients reveal that MERCOSUR and SICA are not in violation of their intertemporal budget constraint, while the intertemporal budget constraint is violated in the Andean Community. The results indicate that the Andean Community should take steps to ensure current account sustainability; otherwise, the member states might fall into a currency crisis and observe large outflows of capital. Even though current accounts are found to be weakly sustainable in MERCOSUR and SICA, all the three trade blocs should take steps to reduce their current account deficits. The three integration blocs mostly comprise developing economies, whose central banks are often unable to manage significant inflows and outflows of capital in the presence of high current account deficits, which might lead to a financial crisis. If the current account deficits grow due to the increase in the domestic investment, then no specific policy measures should be undertaken since higher investment is usually associated with economic growth, increase in capital and productivity. However, if the gap between domestic saving and investment grows due to the decrease in the domestic saving rate, the government needs to introduce policy measures aimed at increasing the domestic saving rate. Such policy measures include reduction in marginal tax rates on wages and business income (Gale and Samwick 2014), steady removal of the estate tax and expansions of tax-advantaged saving vehicles (Hubbard 2006).

5. Conclusions

The paper estimates the degree of capital mobility and current account deficit sustainability by analyzing the relationship between saving and investment. The study investigates the long-run relationship between saving and investment along with short-run dynamics by applying CCEMG estimator to a panel error-correction model. Following findings emerge from the study. First, the Latin American and Caribbean region, MERCOSUR, and SICA are not in violation of their intertemporal budget constraint and don't tend to default on their international debt. However, the estimates of the long-run coefficient in the Andean Community suggest that current account deficit is unsustainable in the customs union and the member states don't meet their solvency constraint. Additionally, the long-run coefficients reveal that current accounts are weakly sustainable in the Latin American and Caribbean region, MERCOSUR, and SICA. Second, MERCOSUR is characterized by the highest degree of current account sustainability out of the three analyzed integration blocks. Third, the error-correction terms and short-run coefficients indicate that Andean Community and MERCOSUR observe higher extent of long-run and short-run capital mobility than SICA. Such results are in line with theoretical predictions that a customs union should observe a higher degree of capital mobility in the long run than a free trade area since the former one is characterized by a higher degree of economic integration. And finally, the sub-period analysis reveals that the pre-crisis period is characterized by increasing current account sustainability in all analyzed samples, which is then followed by a significant decrease in the degree of current account sustainability. In the post-crisis period, CA sustainability has been slowly recovering in the Latin American and Caribbean region and the Andean Community. However, it has continued decreasing in MERCOSUR and SICA.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Sub-samples description.

Sample	Level of economic integration	Period	Member states
Latin America and the Caribbean	-	1984-2017	Argentina, Bahamas, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Trinidad and Tobago, Uruguay, Venezuela. (Number of countries = 24.)
SICA	Free Trade Area	1984-2017	Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Panama. (Number of countries = 8.)
Andean Community	Customs Union	1984-2017	Bolivia, Colombia, Ecuador, Peru. (Number of countries = 4.)
MERCOSUR	Customs Union	1984-2017	Argentina, Brazil, Uruguay, Paraguay, Venezuela. (Number of countries = 5.)

Appendix B

Table B1. Clemente–Montanes–Reyes unit root test results for gross saving as a share of GDP (S/Y).

Country	Single-break unit root test				Double-break unit root test			
	AO model		*IO model*		*AO model*		*IO model*	
	t-stat.	*Structural break*	*t-stat.*	*Structural break*	*t-stat.*	*Structural break*	*t-stat.*	*Structural break*
Argentina	-0.8	1999[b]	-3.6	2000[b]	-4.4	2003[a] 2010[a]	-6.5*	2000[a] 2009[a]
Bahamas	-3.9*	1992[b]	-1.3	1993[b]	-5.5*	1992[a] 2007[a]	-5.9*	1993[a] 2007[a]
Belize	-3.6	1995[a]	-3.2	1992	-3.6	1995[a] 2001	-3.7	1992 1996
Bolivia	-3.2	2008[a]	-4.0	2001[a]	-3.5	2003[a] 2014[a]	-3.3	2002[a] 2014
Brazil	-1.1	1987	-6.7*	1988[a]	-3.1	1987[c] 1992[a]	-6.9*	1986 1988[b]
Chile	-2.5	1989[a]	-5.6*	1994	-6.7*	1989[a] 1995	-0.4	1994 2005
Colombia	-2.0	1993[b]	-3.7	1990	-4.7	1993[a] 2004[a]	-6.7*	1994[b] 2003[c]
Costa Rica	-3.0	1997	-6.7*	1998[c]	-6.7*	1997[c] 2010	-7.5*	1993[b] 1998
Dominican Republic	-5.1*	1995[a]	-4.6*	1995[a]	-5.8*	1995[a] 2003	-5.2	1995[a] 2004
Ecuador	-3.3	2001[a]	-3.8	2003[a]	-5.8*	1996[a] 2006[a]	-5.1	1997[b] 2004[b]
El Salvador	-2.4	2004[a]	-2.7	2003	-5.9*	1992 2004[a]	-2.5	2000 2005
Guatemala	-4.1*	1999[b]	-3.2	1996[b]	-3.9	1999[a] 2007[a]	-4.5	2000[a] 2006[a]
Haiti	-5.2*	1996[a]	-5.8*	1993[a]	-4.2	1988[b] 1995[a]	-9.3*	1986[a] 1993[a]
Honduras	-2.4	1989[a]	-2.7	2006	-3.8	1989[a] 2010[b]	-4.0	1991[b] 1998[a]
Jamaica	-4.7*	1999[a]	-3.6	1992[c]	-3.0	1997 2004	-3.6	1990[c] 1996[b]
Mexico	-1.2	2000[b]	-4.3*	2001[a]	-3.8	1992 2004[a]	-4.3	1986 2001[a]
Nicaragua	-2.4	1997[a]	-4.5*	1996[a]	0.1	1995[b] 2005[b]	-4.6	1996[a] 2006[a]
Panama	-3.7*	2008[a]	-3.2	1990[c]	-4.7	1989[a] 2008[a]	-4.4	1990[b] 2010[b]
Paraguay	-5.1*	2003[a]	-5.4*	2000[a]	-7.5*	1992 2003[a]	-6.9*	1992 2000[a]
Peru	-3.3	2003[a]	-5.3*	2003[a]	-3.7	1995[c] 2005[a]	-5.6*	1992 2004[b]
St. Lucia	-3.7*	1998[a]	-5.2*	1999[a]	-5.9*	1993 1998[a]	-5.4	1994 1999[b]
Trinidad and Tobago	-2.2	2012[a]	-3.1	1999[b]	-2.9	2000[a] 2012[b]	-4.3	1992[c] 2002[a]
Uruguay	-3.1	1998[a]	-5.5*	2000[a]	-0.3	1998 2002[b]	-3.9	1998[c] 2000[b]
Venezuela	-0.9	2012[a]	-4.4*	2013[a]	-3.0	1996[a] 2012[a]	-8.2*	1994[a] 2013[a]

* - null hypothesis of a unit root is rejected at 5% level. a - indicates significance at 1% level; b - indicates significance at 5% level; c - indicates significance at 10% level.

Table B2. Clemente–Montanes–Reyes unit root test results for gross investment as a share of GDP (I/Y).

Country	Single-break unit root test				Double-break unit root test			
	AO model		*IO model*		*AO model*		*IO model*	
	t-stat.	*Structural break*	*t-stat.*	*Structural break*	*t-stat.*	*Structural break*	*t-stat.*	*Structural break*
Argentina	-4.8*	2000	-4.7	2001	-3.9	2000[b] 2005[b]	-5.4	2001[b] 2009[a]
Bahamas	-5.6	1986[a]	-7.2*	1987[a]	-5.9*	1986[a] 2002	-7.6*	1986[a] 2003
Belize	-3.7*	2004[a]	0.1	1992	-4.4	1991 2006[b]	-4.8	1992[c] 1999
Bolivia	-3.1	2010[a]	-3.0	2009[b]	-6.4*	1996 2010[a]	-4.1	1996 2009[a]
Brazil	-3.1	1987	-3.9	1988[b]	1.9	1992 2008	-3.8	1988[b] 2005
Chile	-2.9	1998	-3.0	1997	-6.7*	2000[b] 2007[c]	-3.3	1997[b] 2006
Colombia	-2.5	2007[a]	-4.9*	2004[a]	-4.1	1989 1997	-4.0	1997[c] 2004[a]
Costa Rica	-5.1*	1988[a]	-3.5	1990	-6.1*	1989[a] 2006	-4.9	1990[b] 2007[b]
Dominican Republic	-4.5*	2008[b]	-1.8	2005[a]	-5.2	1987 2008[c]	-1.8	1988 2005[a]
Ecuador	-3.4	2007[a]	-6.0*	2006[a]	-4.1	1991[b] 2007[a]	-5.6*	1991 2006[a]
El Salvador	-4.7*	2004	-2.6	2006	-3.6	1990[a] 2006[a]	-4.9	1990[a] 2007[a]
Guatemala	-2.2	1994[b]	-2.0	1995	-3.4	1999[a] 2009[a]	-4.8	1996[a] 2006[a]
Haiti	-3.6*	1996[a]	-4.8*	1993[a]	2.4	1992 1996[b]	-7.8*	1986[a] 1993[a]
Honduras	-3.1	1989[a]	-3.1	1988	-5.9*	1990[a] 2006[b]	-5.2	1990[a] 2007[a]
Jamaica	-3.4	2010[b]	-3.9	2005[b]	-3.6	1990[c] 2010[a]	-4.6	1987 2007[a]
Mexico	-3.6*	1993	-3.6	1994	-4.2	1993 2004[a]	-3.8	1986 1994
Nicaragua	-1.9	1997[a]	-3.6	1997[b]	-6.4*	1997[a] 2006[b]	-2.2	1998 2005[b]
Panama	-2.5	1993[a]	-3.4	1988[a]	-4.4	1991[a] 2007[a]	-6.1*	1988[a] 2009[b]
Paraguay	-4.9*	2007[c]	-7.1*	2008[a]	-4.1	1995 2007[b]	-4.2	1996 2004[b]
Peru	-3.2	2008[b]	-2.9	2009	-2.7	1986 2007[a]	-3.4	1987 2009
St. Lucia	-2.4	2006	-6.7*	1986	-4.9	1990[b] 2006	-3.6	1990 2007
Trinidad and Tobago	-1.1	2012[a]	-1.6	1997	-2.0	2007 2012[a]	-6.1*	2004[b] 2014[a]
Uruguay	-2.5	2005[a]	-7.8*	2001[a]	-2.8	1992[a] 2005[a]	-2.9	1989[c] 2004[c]
Venezuela	-5.9*	1994[a]	-2.9	1995	-6.7*	1986 1994[b]	-2.9	1987 1995

* - null hypothesis of a unit root is rejected at 5% level. a - indicates significance at 1% level; b - indicates significance at 5% level; c - indicates significance at 10% level.

Appendix C

Table C1. Results of Gregory-Hansen cointegration tests

Country	Cointegration model					
	CC model		*CT model*		*CS model*	
	ADF test statistic	*Break point*	*ADF test statistic*	*Break point*	*ADF test statistic*	*Break point*
Argentina	-4.00	2006	-9.73***	2009	-8.99**	2004
Bahamas	-5.11**	1989	-5.06**	1989	-4.56	1989
Belize	-4.39*	2005	-4.44	2005	-4.46	2005
Bolivia	-3.29	2011	-5.14**	2000	-3.37	2008
Brazil	-6.24***	1990	-16.37***	2003	-4.31	2008
Chile	-4.42*	1999	-5.65***	1999	-4.46	1999
Colombia	-3.72	2006	-4.30	1998	-4.80*	1998
Costa Rica	-5.12**	1988	-5.33**	1988	-4.45	1989
Dominican Republic	-3.32	1991	-4.89*	2005	-3.29	1991
Ecuador	-4.26	1991	-6.70***	1992	-4.13	2000
El Salvador	-4.95**	1989	-5.00	1989	-5.10	1989
Guatemala	-4.54*	2011	-4.81*	1994	-5.89***	2008
Haiti	-4.88**	2010	-5.57***	1993	-4.82*	2010
Honduras	-5.42***	1990	-6.26***	1990	-5.56***	1990
Jamaica	-3.92	2011	-4.17	2011	-3.84	2011
Mexico	-4.08	2002	-22.33***	1991	-4.24	1992
Nicaragua	-5.00**	1988	-5.01**	2001	-5.49***	1988
Panama	-4.88**	1989	-5.27	1989	-4.41	1989
Paraguay	-3.90	2004	-4.03	2004	-3.96	1997
Peru	-3.45	1998	-4.22	1998	-3.50	2000
St. Lucia	-7.23***	1990	-4.04	2009	-4.09	2003
Trinidad and Tobago	-10.78***	2000	-3.31	2002	-5.58***	2000
Uruguay	-6.38***	1998	-10.21***	1988	-4.33	2006
Venezuela	-5.38***	1994	-5.39**	1994	-5.24**	2007

CC, CT, CS denote a cointegration model with a break in a constant term, a break in the constant and the trend, a break in the constant and the slope, respectively. 1, 5 and 10% singificance levels are denoted by ***, ** and *, respectively.

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