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Issiaka Coulibaly
Blaise Gnimassoun

UMR 7235

Université de Paris Ouest Nanterre La Défense
(bâtiment G)
200, Avenue de la République
92001 NANTERRE CEDEX

Tél et Fax : 33.(0)1.40.97.59.07
Email : nasam.zaroualete@u-paris10.fr

Current account sustainability in Sub-Saharan Africa: Does the exchange rate regime matter?[*]

Issiaka Coulibaly[†] and Blaise Gnimassoun[‡]

Abstract

This paper aims at studying the sustainability of current accounts in Sub-Saharan Africa and determining whether this sustainability depends on the exchange rate regime. Relying on a formal theoretical framework and recent panel cointegration techniques, our findings show that current accounts have been globally sustainable in Sub-Saharan Africa countries over the 1980-2011 period. However, this sustainability has been lower for countries operating a fixed exchange rate regime or belonging to a monetary union. We also find that the difference in the level of sustainability could be explained by a higher persistence in the current account adjustment of countries operating under rigid exchange rate regimes.

JEL classification: F31, F33, C33.

Keywords: Current account, Exchange rate regime, Panel cointegration tests, Sub-Saharan Africa.

[*] *Corresponding author*: Blaise Gnimassoun, EconomiX-CNRS, University of Paris Ouest, 200 avenue de la République, 92001 Nanterre cedex, France. Tel. 33 1 40 97 56 63. Email: blaise.gnimassoun@u-paris10.fr. We are grateful to Cécile Couharde and Valérie Mignon for helpful comments and suggestions.
[†] Erudite (UPEC), University of Paris Est, France.
[‡]EconomiX-CNRS, University of Paris Ouest, France.

1. Introduction

Within the global financial integration context, current account sustainability has become a major macroeconomic policy issue (Milesi-Ferretti and Razin, 1996; Mann, 2002; Christopoulos and León-Ledesma, 2010). Indeed, the liberalisation of international financial markets allows for a relaxation of external financial constraints resulting in current account disequilibrium. Current account imbalances could then reflect an optimal allocation of resources between countries based on the quest for improved productivity. However, imbalances may also turn in "bad imbalances" if they induce an accumulation of external debt which diminishes the credibility of a country and its ability to access to external funding.

Interest on this subject has been renewed by the high current account deficit of the United States. More recently, the onset of the financial crisis in 2008 has highlighted the problems of diverging external imbalances at a world level and, notably, within the euro area. The empirical studies on current account sustainability lead however to mixed results. Indeed, authors such as Wu et al. (2001), Matsubayashi (2005) and Christopoulos and León-Ledesma (2010) find that the US current account has been sustainable while others argue that it follows an unsustainable path (see Fountas and Wu, 1999; Lui and Tanner, 2001; Dulger and Ozdemir, 2005; Engel and Rogers, 2006; Chen, 2011). Regarding the euro area, some studies show that current account imbalances have increased since the introduction of the euro, highlighting the unsustainability of the current account, particularly in the so-called peripheral countries (see for instance, Berger and Nitsch, 2010; Homes et al., 2010; Proaño et al., 2012 and Körner and Zemanek, 2013).

If the literature is mainly focused on developed economies, some studies are devoted to developing countries where the issue of sustainable current account is even more acute. Indeed, these countries are generally characterized by a lack of credibility which makes external financing more difficult and/or more costly (i.e. subject to a high-risk premium). They also have few sources of revenue, due to exports highly specialized (generally commodities) and a strong exposition to both internal and external shocks, which prevents many of them to honour their commitments. Even developing countries that are experiencing high growth rates can face some difficulties to raise funds in international financial markets (Bhattacharya et al., 1997 and Basu and Srinivasan, 2002). Aizenman and Sun (2010) argue that whereas financial globalization has led to deeper financial diversification and growing importance of foreign direct investment, it did not generate significant increase in the net resources available to finance growth of developing countries. This evidences the challenge for these countries to stabilize their current account imbalances in order to improve their credibility and to benefit from global financial integration. Therefore, the World Bank and the International Monetary Fund (IMF) have launched in 1996 a program named “heavily indebted poor countries (HIPC) Initiative”[1] which aims at reducing the overall debt of the most heavily indebted countries to sustainable levels.

[1] The HIPC Initiative was further expanded in late 1998 (Enhanced HIPC Initiative). In 2005, to accelerate progress towards the United Nations Millennium Development Goals (MDGs), the HIPC Initiative was supplemented by the Multilateral Debt Relief Initiative (MDRI) which allows for 100 percent relief on eligible debts by three multilateral institutions—the IMF, the World Bank, and the African Development Fund (ADF) — for countries completing the HIPC Initiative process.

Empirically, Narayan and Narayan (2005) have analyzed the sustainability of current accounts for a sample of 22 least developed countries (LDCs) over the 1960-2000 period and found mitigated results. Indeed, studying the long-run relationship between exports and imports, they show that only 6 out of 22 countries have experienced sustainable current accounts. Their findings contrast with those of Holmes (2003) and Chu et al. (2007) which focus on Sub-Saharan African (SSA) countries respectively over the 1960-2000 and 1980-2004 periods. Indeed, relying on the SURADF[2] tests, initially introduced by Breuer et al. (2001), Holmes (2003) highlights that the current accounts of 26 African countries have been sustainable, while Chu et al. (2007) reach similar conclusions for a larger sample of 48 African states. Adededji (2001) also obtains the same result for Nigeria over the 1960-1997 period. However, using a different methodology, Hamori and Hashiguchi (2012) find mixed results for a sample of 37 SSA countries over the 1980-2006 period. Relying on panel unit root tests, they show that these countries' trade balances are unsustainable when cross-section dependencies are taken into account while they are sustainable when this property is missed.[3] Overall, those controversial results show that they depend heavily on the used methodology and approach, highlighting the need to use appropriate and robust empirical frameworks.

One other important shortcoming of previous literature is that it generally pays little attention to the causes of external imbalances. As noticed by Milesi-Ferretti and Razin (1997), the sustainability is linked to various factors, as: the size of the export sector and the level of international competitiveness, the level of domestic savings, the composition of external liabilities, the strength of the financial system, the degree of political stability and the degree of exchange-rate flexibility and exchange rate policy. We pay special attention to this last channel in the present study. Indeed, this issue is important as many SSA countries are usually characterized by weak current account sustainability and have planned to change their exchange rate regimes towards monetary union projects. So addressing this issue can provide important lessons regarding the choice of an appropriate exchange rate regime especially in a context where the issue of this choice is topical for these countries (Carton et al, 2010; Loureiro et al., 2012; Coulibaly and Gnimassoun, 2013; among other).

There is an important debate on the role of exchange rate regimes in the adjustment of current accounts and, consequently, in current account sustainability. On the one hand, as suggested by Mundell (1961), the exchange rate regime influences the ability of a country to cope with shocks and thus to absorb (external) imbalances. For instance, subject to the validation of the critical elasticities' theorem (or Marshall-Lerner condition)[4], countries which have adopted flexible exchange rate regimes could depreciate their currency to restore the trade balance while countries with pegged currencies could not use such a tool without significant cost (Klein and Shambaugh, 2010). Consequently, one could expect that the more flexible the

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[2] Seemingly Unrelated Regressions Augmented Dickey-Fuller.

[3] See also Milesi-Ferretti and Razin (1997) and Roubini and Wachtel (1998) for studies on East Asia and Latin America, and transition economies, respectively.

[4] The Marshall-Lerner condition is met if the positive volume effect (lower imports and higher exports) resulting from a devaluation or a depreciation outweighs the negative price effect (higher import costs). Formally, this condition will depend on price elasticities of imports and exports. If goods exported and imported are sufficiently elastic to price, a currency devaluation or a depreciation will have a positive impact on trade balance.

exchange rate regime of a country is, the higher is its capacity to maintain its current account to a sustainable level. This hypothesis, firstly suggested by Friedman (1953), is strengthened by the results of recent studies of Broda (2004), Herrmann (2009), Tippkötter (2010) and Ghosh et al. (2013). Coudert and Couharde (2009), Dubas (2009) and Holtemöller and Mallick (2012) have also highlighted greater currency misalignments in countries with fixed currencies than in countries operating under a flexible or an intermediate exchange rate regime. The negative effects of exchange rate misalignments (specifically currency overvaluations) on current accounts have been recently evidenced by Arghyrou and Chortareas (2008), Belke and Dreger (2011), Proaño et al. (2012) and Chen et al. (2013).

On the other hand, fixed exchange regimes are usually seen as conducive to prudent fiscal policies, which may result in sustainable current accounts. Monetary unions, through a higher financial integration, are expected to lead to an efficient accumulation of net assets and liabilities in the members countries and then to good imbalances (see Blanchard and Giavazzi, 2002 for the euro zone). Moreover, Chinn and Wei (2013) find no strong and robust empirical relationship between exchange rate regime flexibility and the rate of current account reversion.

Consequently, our aim in this paper is to analyze the sustainability of current accounts in SSA countries, paying a specific attention to their exchange rate regimes. More precisely, we investigate whether the exchange rate regime matters in current accounts' sustainability. To this end, we firstly analyse the current account sustainability according the used exchange rate regime. Secondly, we study the adjustment process of current account in order to investigate the channel through which the exchange rate regime could affect the current account sustainability. Finally, for robustness concerns, we deepen our analysis by studying the impact of HIPC initiative and by accounting for the issue of countries' specialization. Indeed, given that some SSA countries have benefited from the HIPC initiative, we have to analyze the impact of this initiative on current account sustainability for ensuring that this effect does not bias the role played by the exchange rate regime. The specialization also appears as a key issue in Sub-Saharan Africa given that most oil-producing countries in this area have paradoxically a fixed exchange rate regime while they are more likely to cope with terms of trade shocks. [5] We thus assess the impacts of exchange rate regime on current account sustainability regardless the potential terms-of-trade effect resulting from the fact that most oil producers in Sub-Saharan Africa have fixed exchange rate regimes.

Accordingly, relying on a formal theoretical framework initially developed by Husted (1992), we use recent panel cointegration techniques to deal with the statistical shortcomings of previous studies by accounting for both cross-sectional dependencies and structural breaks. Indeed, as pointed out by Westerlund and Edgerton (2008), these properties are likely to characterize macroeconomic variables—as those considered in this study—since they are generally affected by the international conjuncture resulting in strong inter-economy linkages and exposed to shocks (internal and/or external). Not taking them into account leads to biased results and interpretations. In Sub-Saharan Africa, only Hamari and Hashiguchi (2012) have

[5] Among the eight oil-producing countries in our sample (Angola, Cameroon, Chad, Congo Rep., Equatorial Guinea, Gabon and Nigeria, Sudan), five essentially of the CFA zone (Cameroon, Chad, Congo Rep., Equatorial Guinea, Gabon) have a fixed exchange rate regime. See Table A.2 in the Appendix for more details.

considered cross-sectional dependencies between countries but ignored the possibility of structural breaks. In our study, we fill this gap by using panel econometric procedures dealing with these issues.

Considering a panel of 44 SSA countries over the 1980-2011 period, our results show that current accounts have been globally sustainable. Indeed, over the considered period, the exports of SSA countries have followed the same trend as their imports.[6] However, this sustainability has been lower for countries operating a fixed exchange rate regime or belonging to a monetary union. Studying the adjustment process of the current account of these countries, we find that the difference in the level of sustainability could be explained by a higher persistence in the current account adjustment of countries operating rigid exchange rate regimes. This finding is consistent with arguments in favor of flexible exchange rate regimes, highlighting their capacity to facilitate external adjustment (Friedman, 1953). Finally, we show that the HIPC initiative allowed a significant improvement of the current account sustainability in the recipient countries. However, these results do not affect the previous conclusions that are also robust to the countries' specialization.

The rest of the paper is organized as follows. Section 2 presents the theoretical background relying on the current account sustainability literature. Section 3 describes data and econometric methodologies. Section 4 focuses on the estimation results, their robustness and their interpretations. Section 5 concludes the paper.

2. Studying current account sustainability: approaches and choice of theoretical framework

The purpose of this section is twofold: (i) briefly review the approaches used in the literature to empirically test the sustainability of the current account as well as their economic foundations, and (ii) present the appropriate theoretical framework for such a study on SSA countries.

2.1. Testing for current account sustainability: a brief survey

Various approaches have been used in the literature to tackle the issue of current account (or external, in general) sustainability. This multiplicity of frameworks partly reflects the looseness of theoretical criteria for external sustainability. Milesi-Ferretti and Razin (1996) distinguish between three recurring concepts related to external imbalances that can sometimes be confused: *solvency* of a debtor country, *sustainability* of current account imbalances and *excessive* current account imbalances. The solvency is defined by the external intertemporal budget constraint that the current indebtedness must be offset by the present value of expected future trade surpluses.[7] Sustainability can be linked to solvency, but it is based on the assumption of a continuation into the indefinite future of the current policy stance. More specifically, the current account is sustainable whether a continuation of current government policy into the indefinite future does not imply the violation of external budget

[6] More precisely, imports plus interest payments on the external debt (see section 2).
[7] So defined, the lack of clarity on the future direction of economic policy inhibits the practical applicability of solvency hypothesis as pointed out Milesi-Ferretti and Razin (1996).

constraint. According to Milesi-Ferretti and Razin (1996), this definition is more appropriate in the context of fiscal imbalances given that the latter stem directly from government decisions about taxation and public spending. However, it appears less suitable for current account imbalances because such disequilibria are a function of the interactions between government decisions and private decisions (both domestic and foreign) in terms of investment and savings. Alternatively, these authors suggest that external sustainability of an economy implies that the intertemporal budget constraint will be met without a "drastic" policy shift. Regarding excessive current account imbalances, they refer to the notion of equilibrium current account that may be obtained from a model including medium-run determinants of savings and investment. Current account imbalances are thus considered excessive by reference to this equilibrium level. This approach is in line with the works of Debelle and Faruqee (1998) and Chinn and Prasad (2003) on medium-term current account determinants and is often used in the literature about fundamental equilibrium exchange rates (FEER) (see Jeong and Mazier, 2003; Coudert and Couharde, 2007). It is also retained in the analysis of the macroeconomic balance approach of the IMF's Consultative Group on Exchange Rate Issues (CGER) (Faruqee et al., 2001 and IMF, 2006). Moreover, because of global imbalances that have been widely developed before the 2008 financial and economic crisis, recent studies have also estimated the equilibrium current account to assess the level of discrepancies and analyze their adjustments. Indeed, analyzing the external adjustment that preceded the 2008 global crisis, Lane and Milesi-Ferretti (2012) have estimated excessive current account imbalances defined as the difference between the observed and the equilibrium current accounts; the latter being derived from the estimation of a model including current account fundamentals. Gnimassoun and Mignon (2013) also used this approach to study the role of exchange rate misalignments in the adjustment of current account imbalances in industrialized countries.

Other authors have discussed the concept of current account sustainability. Roubini and Wachtel (1998) argue that sustainable current account imbalances are those that can be maintained without incurring an external sector crisis (especially a currency crisis). Starting from the principle that the current account is not a fundamental economic force in itself, but rather a manifestation of the general equilibrium interaction between many factors, Mann (2002) distinguishes three approaches of the current account balance: 1) a domestic approach based on national income and product accounts; 2) an international approach based on trade flows in goods and services; and 3) an international approach based on trade flows and holdings of financial assets. The author deduces that the current account is sustainable if the external imbalance generates no economic forces that change its trajectory.

Moreover, considering the expansion of financial globalization, some recent studies focus on the current account approach related to flows and holdings of financial assets by highlighting the role of valuation effects (capital gains or losses on net foreign asset positions) in the analysis of external sustainability. Valuation effects and their influences on the current account have recently been documented in the literature by Lane and Milesi-Ferretti (2004), Edwards (2005) and Gourinchas and Rey (2005), among others. Indeed, financial globalization has led to an increase in foreign assets and liabilities in several countries. Accordingly, the asset portfolios of these countries are likely to be seriously affected by

changes in their prices, giving rise to significant transfers of wealth between countries that influence the dynamics of the stock of foreign assets. In order to better understand the adjustment of the current account and to study its sustainability, it appears important to account for valuation effects especially for highly financially integrated countries.

In practice, three empirical approaches for testing current account sustainability can be related to these different definitions: 1) the external intertemporal budget constraint approach based on trade flows; 2) the valuation effect approach based on the dynamic of net foreign assets; and 3) the saving-investment approach based on disequilibria between saving and investment—the latter approach being rather used for investigating excessive current account imbalances. Most of the empirical studies rely on the first approach originally developed to analyze the sustainability of fiscal imbalances. Specifically, these studies examine current account sustainability through analyzing the stationarity of the current account or, equivalently, through a cointegration study between exports and imports plus interest payments on the external debt, in accordance with the theoretical frameworks proposed by Hakkio and Rush (1991), Trehan and Walsh (1991) and Husted (1992). Thanks to its simplicity, this approach based on stationarity or cointegration tests has been widely used in the recent literature (Lui and Tanner, 2001; Wu et al., 2001, Baharumshah et al., 2003; Dulger and Ozdemir, 2005; Matsubayashi, 2005; Narayan and Narayan, 2005; Engel and Rogers, 2006; Christopoulos and León-Ledesma, 2010; Chen, 2011; Hamori and Hashiguchi, 2012; Chen, 2013, among others). Turning to the second, valuation effects' approach, it can be performed through unit root tests on net foreign assets (see Camarero et al., 2010, 2013). The savings-investment approach can be empirically studied by examining the difference between the observed current account and its estimated level on the basis of the determinants of savings and investment (see Lane and Milesi-Ferretti, 2012; Gnimassoun and Mignon, 2013).

In this paper, we use the trade flows-based approach which relies on the theoretical framework presented below and which is more relevant for SSA countries. Indeed, most SSA countries are small economies that are poorly integrated to the international financial market. As emphasized by Roubini and Wachtel (1998), weak banking and financial systems make those countries often unable to cope with large capital flows. It is then reasonable to assume that their current accounts are mainly determined by real international transactions.

2.2. Theoretical background: the trade flows approach

As previously mentioned, current account sustainability has been studied in several theoretical models based on the intertemporal budget constraint. One of the most popular theoretical approaches is that developed by Husted (1992). Indeed, this approach is simple to implement empirically and appropriate for analysing the case of small countries with low levels of financial integration, thus relevant for most developing countries as the ones in Sub-Saharan Africa. Analysing the behaviour of a representative agent in a small open economy that produces and exports a single composite good, Husted (1992) shows in fact that studying current account sustainability of an economy amounts to investigating a cointegrating relationship between exports and imports of this economy. We propose a similar approach starting with macroeconomic equilibrium of a small open economy given by the equality between aggregate supply and aggregate demand:

$$Y_t + M_t = C_t + I_t + G_t + X_t \qquad (1)$$

where Y_t , C_t , I_t and G_t refer to output, current consumption, investment and public expenditure; M_t and X_t denoting imports and exports, respectively. Since the considered economy has the ability to borrow and lend on the international financial market at a given interest rate, its intertemporal budget constraint is given by:

$$C_t + G_t = Y_t - I_t + [B_t - (1 + r_t)B_{t-1}] \qquad (2)$$

where r_t is the one-period world interest rate, B_t correspond to international borrowing (positive or negative) and B_{t-1} is the country's initial external debt. Equation (2) means that the total consumption (private and public) of the economy is equal to the difference between output and investment plus the difference between the current borrowing and the initial borrowing plus debt service. Combining equations (1) and (2), we obtain:

$$M_t + (1 + r_t)B_{t-1} = X_t + B_t \qquad (3)$$

Assuming that the interest rate is stationary around a mean r and further supposing $W_t = M_t + (r_t - r)B_{t-1}$, equation (3) can be written:

$$W_t + (1 + r)B_{t-1} = X_t + B_t \qquad (4)$$

or

$$B_t = \frac{1}{1+r}(X_{t+1} - W_{t+1}) + \frac{1}{1+r}B_{t+1} \qquad (5)$$

Solving (5) forward yields:

$$B_t = \sum_{j=0}^{\infty}\left(\frac{1}{1+r}\right)^{j+1}(X_{t+j+1} - W_{t+j+1}) + \lim_{j\to\infty}\left(\frac{1}{1+r}\right)^{j+1}B_{t+j+1} \qquad (6)$$

Defining $E_t(.)$ as an expectation conditional on information at time t, current account sustainability holds if and only if:

$$\lim_{j\to\infty}\left(\frac{1}{1+r}\right)^{j+1}E_t(B_{t+j+1}) = 0 \qquad (7)$$

This implies that the current stock of outstanding debt, B_t, is equal to the discounted value of future trade surpluses. In other words, when a country is solvent, the present value of its future external debt tends to zero in the long run. This assumption, known in the literature as the "no Ponzi-game" condition, implies that a country cannot always pay interest on its foreign debt by simply borrowing more.

Taking equation (6) in first difference and considering equation (3), the current account could be expressed as follows:

$$-M_t - r_tB_{t-1} + X_t = -\sum_{j=0}^{\infty}\left(\frac{1}{1+r}\right)^{j+1}(\Delta X_{t+j+1} - \Delta W_{t+j+1}) - \lim_{j\to\infty}\left(\frac{1}{1+r}\right)^{j+1}\Delta B_{t+j+1} \qquad (8)$$

where Δ is the first difference operator and $MM_t = M_t + r_tB_{t-1}$ represents spending on imports inclusive of interest payments on external debt.

Following previous literature, assuming that the variables X_t and W_t are integrated of order one, we have:

$$X_t = \omega_1 + X_{t-1} + \mu_{1t} \qquad (9)$$

$$W_t = \omega_2 + W_{t-1} + \mu_{2t} \qquad (10)$$

with μ_{jt} denoting the independent and identically distributed error terms and ω_j the deterministic components ($j = 1, 2$).

Considering equations (7), (9) and (10), equation (8) can be written as follows:

$$X_t = \alpha + \beta MM_t + \epsilon_t \qquad (11)$$

where $\alpha = \Sigma \left(\frac{1}{1+r}\right)^{j+1} (\omega_2 - \omega_1)$ and $\varepsilon_t = \Sigma \left(\frac{1}{1+r}\right)^{j+1} (\mu_{2t} - \mu_{1t})$.

Consequently, the current account is sustainable when the paths of exports and imports are consistent with respect to the intertemporal budget constraint. In this case, there exists a cointegration relationship between X_t and MM_t. Thus, with unchanged policies, current account imbalances cannot be durable and must converge asymptotically to zero (see Husted, 1992 and Holmes, 2006). Otherwise, the current account is considered as unsustainable. In the latter case, there may be a need for the government to change its policy and implement remedial action. Moreover, according to Quintos (1995) current account is "strongly sustainable" when $\beta = 1$ and "weakly sustainable" when $0 < \beta < 1$.[8] Finally, as previously mentioned, we also investigate the sustainability according to the exchange rate regime. Indeed, it is generally suggested in the literature that both sides of equation (11) depend on the real exchange rate (e) evolution, which is also linked to the exchange rate regime. Moreover, the exchange rate exerts a pass-through effect on exports and imports prices which could be different (see for instance Choudhri and Hakura, 2012). In addition to the real exchange rate, it also is suggested that a country's exports generally depend on world demand (D^*) whereas its imports are explained by domestic demand (D). Thus equation (11) becomes:

$$X_t(D^*, e) = \alpha + \beta MM_t(D, e) + \epsilon_t \qquad (12)$$

3. Data and empirical methodology

We consider a panel of 44 SSA countries, for which data are available over the period 1980-2011 (see the list of countries in Table A.2 in the Appendix). For the sake of completeness and as robustness checks, we also consider four types of data as in Husted (1992): (1) nominal data, (2) real or constant data, (3) nominal data relative to current GDP, and (4) real data as a percentage of real GDP. As mentioned in the previous section, to analyze current account sustainability, we need the series of exports of goods and services (X_t) and imports of goods and services plus interest payments on external debt (MM_t). These data come from the United Nations Conference on Trade and Development (UNCTAD) database. To analyze the persistence of current account adjustment, we have also collected data of the current account balance expressed in percentage of GDP from the UNCTAD database.[9]

[8] Note that $\beta > 1$ is consistent with a surplus, since exports are growing at a faster rate than (interest inclusive) imports expenditures.

[9] Data are represented on Graphs A.2 to A.6 in the Appendix.

As previously mentioned, analyzing current account sustainability can be done by testing and estimating a cointegration relationship between exports and imports plus interest payments on external debt. Thus, our empirical methodology is based on panel cointegration techniques, following three steps: unit root tests, cointegration tests and estimation of the cointegration relationship.

3.1. Panel unit root tests

We rely on a third generation panel unit root test which accounts for both cross-sectional dependencies and structural breaks in the series. These properties are indeed likely to characterize macroeconomic variables—as those considered in this study—since they are generally affected by the international conjuncture resulting in strong inter-economy linkages and exposed to shocks (internal and/or external). By taking those specificities into account, third generation tests allow overcoming the deficiencies of the previous generations' tests. [10]

We consider the test developed by Carrion-i-Silvestre et al. (2005) which is a generalization of Hadri (2000)'s panel unit root test. Carrion-i-Silvestre et al.'s (2005) test allows for the presence of multiple unknown structural breaks under the null hypothesis of stationarity and does not impose cross-section independence in the error terms through bootstrapping. Two models have been proposed by the authors: (i) a model with constant allowing for breaks in level, and (ii) a model with constant and trend, allowing for breaks in both intercept and deterministic trend. The authors have also provided two different test statistics depending on the structure of the long-run variance of the error terms which can be homogeneous or heterogeneous across countries.[11]

Results are summarized in table 1 below. They show that the null hypothesis of stationarity is strongly rejected for both exports (X_t) and imports plus interest payments on external debt (MM_t) whether they are expressed in nominal or constant terms or relatively to GDP. Consequently, we can now test for the existence of a cointegration relationship between these series.

Table 1: Unit root tests

	X_t		MM_t	
	With constant	With constant and trend	With constant	With constant and trend
		Nominal		
Homogeneous	19.225***	16.063***	13.707***	26.098***
Heterogeneous	15.218***	30.616***	17.191***	30.006***
		Real		
Homogeneous	22.099***	2.786***	21.136***	61.589***
Heterogeneous	12.942***	30.027***	13.809***	42.625***
		Nominal to GDP		
Homogeneous	1.157	14.237***	1.383*	8.002***
Heterogeneous	6.868***	21.623***	6.346***	15.685***
		Real to GDP		
Homogeneous	2.611***	8.358***	2.664***	10.859***
Heterogeneous	4.791***	17.326***	5.071***	25.632***

[10] For details about these tests, see Banerjee (1999) and Hurlin and Mignon (2007).
[11] For a summary of the test of Carrion-i-Silvestre et al. (2005), see Couharde et al. (2013).

Note: ***, ** and * mean that the null hypothesis of stationarity is rejected at 1%, 5% and 10% levels, respectively.

3.2. Cointegration tests

To investigate sustainability of current accounts in SSA, we rely on the cointegration tests proposed by Westerlund (2007) and Westerlund and Edgerton (2008). Westerlund (2007)'s second-generation panel cointegration test relies on an error-correction model and tests the significance of the error-correction coefficient, while the third-generation test proposed by Westerlund and Edgerton (2008) is based on the residuals of the cointegration relationship. Both tests account for the cross section dependence between countries.[12] In addition, the Westerlund and Edgerton (2008)'s test accounts for the possibility of structural breaks in the long run relationship.

In the Westerlund (2007)'s test, the null hypothesis of no cointegration corresponds to the case where the error-correction coefficient is not significant for all countries. The alternative hypothesis depends on whether the cointegrating vector (in other words, the error-correction coefficient) is homogeneous or heterogeneous. Westerlund (2007) has provided four statistic tests: two assuming heterogeneous cointegrating vectors ($G_t \; and \; G_a$) and two other supposing that the error-correction coefficient is the same for all countries ($P_t \; and \; P_a$). The author also considers two types of models: a model with constant and a model with both constant and trend.[13]

Turning to the Westerlund and Edgerton (2008)'s test, it is flexible enough to allow for heteroskedastic and serially correlated errors, individual-specific intercepts and time trends, cross-sectional dependence and unknown breaks in both the intercept and slope of the cointegrating regression, which may be located at different dates for different units. The authors have proposed a Lagrange Multiplier (LM) based unit root test on the residuals of the cointegration relationship which includes deterministic components. This test focuses on the case of heterogeneous cointegrating vectors, and is based on the null hypothesis of no cointegration.[14] Three different cases are considered: no break (case 1), break in level (case 2) and break in intercept and slope (case 3). Case 1 is similar to the Westerlund (2007)'s test since it only accounts for cross-section dependencies.

The results of the cointegration tests are summarized in table 2 below. The four test statistics proposed by Westerlund (2007) strongly reject the null hypothesis of no cointegration between exports and imports plus interest payments on external debt. This finding remains valid whatever the considered model and the used data, indicating that current accounts in SSA countries have been globally sustainable over the 1980-2011 period. The Westerlund and

[12] To test the hypothesis of cross-sectional dependencies in the cointegration relationship, we have computed the Breusch-Pagan statistic (see Greene, 2000, p. 601) and applied the test developed by Pesaran (2004) on the estimated residuals. These two methods are complementary since the Breusch-Pagan statistic is relevant when N (individual dimension of the panel) is small and T (time dimension) is large, while the test proposed by Pesaran (2004) is valid when T is small and N is large. The results of both tests are summarized in Table A.3 in the appendix and strongly reject the null hypothesis of absence of cross-section dependencies.

[13] For more details on this test, see for example Coulibaly and Gnimassoun (2013).

[14] Given our relatively large number of countries, the hypothesis of heterogeneity is more relevant.

Edgerton (2008)'s test leads to the same conclusion, evidencing the existence of a long-run relationship between exports and imports plus interest payments on external debt. To summarize, the null hypothesis of no cointegration is strongly rejected.

Table 2: Cointegration tests

	Westerlund (2007)[a]						Westerlund and Edgerton (2008)[b]				
	With constant			With constant and trend				No break		Level break	
Statistics	Value	Z-Value	P-Value	Value	Z-Value	P-Value	Statistics	Value	P-Value	Value	P-Value
Nominal											
G_t	-2.508	-5.391	0.000	-2.971	-4.936	0.000	$Z_\tau(N)$	-8.102	0.000	-2.626	0.004
G_a	-11.872	-5.763	0.000	-13.721	-1.668	0.000					
P_t	-15.111	-5.541	0.001	-19.447	-6.214	0.002	$Z_\phi(N)$	-11.016	0.000	-3.209	0.001
P_a	-9.112	-7.293	0.000	-12.096	-3.422	0.003					
Constant											
G_t	-2.396	-4.565	0.000	-2.929	-4.590	0.000	$Z_\tau(N)$	-8.335	0.000	-2.011	0.022
G_a	-9.621	-3.020	0.001	-12.178	-0.163	0.006					
P_t	-13.728	-4.150	0.000	-18.140	-4.720	0.004	$Z_\phi(N)$	-14.195	0.000	-2.832	0.002
P_a	-7.595	-5.027	0.000	-12.414	-3.766	0.000					
Nominal to GDP											
G_t	-2.140	-2.679	0.005	-2.780	-3.377	0.009	$Z_\tau(N)$	-7.677	0.000	-2.032	0.021
G_a	-8.476	-1.625	0.003	-12.712	-0.683	0.000					
P_t	-10.183	-0.584	0.215	-17.645	-4.153	0.016	$Z_\phi(N)$	-12.861	0.000	-2.974	0.001
P_a	-4.571	-0.508	0.159	-12.057	-3.380	0.006					
Constant to GDP											
G_t	-2.080	-2.230	0.007	-2.837	-3.844	0.000	$Z_\tau(N)$	-4.080	0.000	-1.569	0.058
G_a	-8.007	-1.053	0.003	-12.509	-0.485	0.001					
P_t	-10.278	-0.680	0.177	-17.753	-4.278	0.007	$Z_\phi(N)$	-8.894	0.000	-2.719	0.003
P_a	-4.493	-0.393	0.155	-11.550	-2.831	0.004					

Notes:
(a): P-values are robust critical values obtained through bootstrapping with 1000 replications. The Bartlett kernel window width is set according to $4(T/100)^{2/9} \approx 3$. Only bootstrap P-Values are reported.
(b): A deterministic trend and constant is allowed in all specifications as in Westerlund and Edgerton (2008).

4. Estimation results and interpretations

After having evidenced that the current account has been globally sustainable in SSA, we can now estimate the coefficient β of equation (12)—also known as the "sustainability coefficient"—to assess its level. This involves estimating the cointegrating relationship between exports of goods and services and imports of goods and services plus interest payments (receipts) on external debt (assets). To do this, we use the Panel Dynamic OLS (PDOLS) method developed by Mark and Sul (2003), which is more efficient for estimating a panel cointegration relationship than other competing estimators as OLS and FMOLS[15] (see Kao and Chiang, 2000). One interesting feature of the Mark and Sul (2003)'s method is that it considers that the coefficients are homogeneous between countries in long-run while they are

[15] Fully Modified Ordinary Least Squares.

supposed to be heterogeneous in short-run. Consequently, this method partially answers to the question of potential heterogeneity between countries of the sample often alleged to several panel data estimators which generally suppose that the coefficients are homogeneous both in short and long run.

Roughly speaking, the PDOLS procedure consists in augmenting the cointegrating relationship with leads and lags of the first difference of the explanatory variables which will be used as instruments of both explanatory and explained variables. We consider the following most general specification proposed by Mark and Sul (2003):

$$\ln(X_{i,t}) = \vartheta_i + \varphi_i t + \theta_t + \beta \ln(MM_{i,t}) + \xi_{i,t} \qquad (13)$$

The above equation accounts for country specific effects (ϑ_i), heterogeneous linear trends ($\varphi_i t$) and common time effects (θ_t) allowing for some degree of cross-section dependence. For robustness checks, we consider four different specifications depending on the inclusion of deterministic components: (i) a model with only country specific effects (PDOLS1), (ii) a model with fixed and common time effects (PDOLS2), (iii) a model with fixed effects and heterogeneous trends (PDOLS3) and (iv) a model with country specific effects, heterogeneous trends and common time effects (PDOLS4). The last two specifications appear the most comprehensive since they respectively represent the first two models to which heterogeneous trends are added. Economically, accounting for heterogeneous deterministic trends allows controlling for phenomena such as the tendency of developing countries to have current account deficits, namely through more imports.[16] In our estimations, we focus on the significance of our coefficient of interest (β) in order to corroborate the hypothesis of current account sustainability in SSA. We also test whether this coefficient is significantly different from one ($\beta = 1$ *versus* $\beta \neq 1$) to assess whether the degree of external sustainability in SSA has been weak or strong. The results of the Panel DOLS estimations are presented in tables 3 and 4.

4.1. Exchange rate regimes and current account sustainability

In order to check whether the exchange rate regime affects current account sustainability in SSA countries, we grouped the latter according to their regime using the *de facto* classification scheme proposed by Ilzetzki et al. (2008), a recent version of Reinhart and Rogoff's (2004) classification. Relying on this classification, we have gathered SSA countries into three different exchange rate regimes (fixe, intermediate and flexible) as Chinn and Wei (2013) and Pancaro (2013).[17] The PDOLS estimation results of the long-run relationship between exports and imports, for these groups as well as for all SSA countries, are summarized in table 3 below. The null hypothesis of no significant sustainability coefficient is strongly rejected in all cases confirming that the current account has been globally sustainable

[16] This tendency could be explained by the evolution of economic fundamentals in these countries such as greater population growth, higher fiscal deficits or also unstable level of exports depending on terms of trade shocks as well as the increasing openness of economies.

[17] Each country is classified according to its belonging to a particular exchange rate regime over the period 1980-2010. Given that some countries have often changed their exchange rate regimes, they are considered as belonging to the regime they have most used over the period under study. For more details, see tables A1 and A2 in Appendix.

in SSA. Our results are thus similar to those of Holmes (2003) and Chu et al. (2007) dealing with samples composed mostly by SSA countries. However, they rely solely on unit root tests to investigate the hypothesis of sustainability. Consequently, we go further than previous studies by estimating the level of sustainability and highlighting that the latter is likely to depend on the exchange rate regime when heterogeneous time effects are taken into account (PDOLS3 and PDOLS4). Indeed, our findings show that the level of current account sustainability is higher in countries operating flexible exchange rate regimes than in countries having intermediate or fixed regimes. For all specifications and data considered, the coefficient of sustainability is not significantly different from unity in flexible regime' countries while it is significantly lower than one in the two other regimes, especially when data are deflated by GDP. Between intermediate and fixed regimes, the level of sustainability is not significantly different when considering real data, whereas it is slightly higher for intermediate regime when using nominal data. Consequently, for SSA countries, one could argue that the more flexible the exchange rate regime is, the higher is the capacity of a country to maintain its current account at a sustainable level. To confirm this assumption, we have compared countries belonging to monetary union with those having their own currencies (see table A.4 in the appendix). The estimation results corroborate our previous findings by showing that the level of current account sustainability has been lower in countries engaged in monetary union. To test the robustness of these findings, we have also considered the IMF official (or *de jure*) classification scheme, leading to similar results as those obtained with the *de facto* classification scheme of Ilzetzki et al. (2008).[18]

On the whole, the sustainability of the current account seems to be higher when considering nominal data. This is likely due to the effects of prices which tend to overestimate the sustainability level. The sustainability is also higher when data are not deflated by GDP. These results are not surprising when we closely look at the relationship between exports and imports plus interest payments on external debt (see scatter graphs in the appendix, Graph A.1). Indeed, it clearly appears that the dispersion between the points is much larger when variables are deflated by GDP, which suggests a weaker long-term relationship. Such a result has been also found by Husted (1992) and Fountas and Wu (1999) who used the same types of variables.

Table 3: Sustainability coefficient by exchange rate regime

Panel	SSA countries (44)		Fixed Exchange rate regime (18)		Intermediate Exchange rate regime (13)		Flexible exchange rate regime (13)	
	Coef.	t-stat	**Coef.**	t-stat	**Coef.**	t-stat	**Coef.**	t-stat
				Nominal				
PDOLS 1	1.16***a	(22.28)	1.26***a	(15.86)	1.14***	(14.37)	0.96***	(16.48)
PDOLS 2	1.19***a	(19.37)	1.21***	(14.22)	1.24***a	(14.36)	1.10***	(11.95)
PDOLS 3	1.01***	(21.46)	0.89***	(8.51)	1.05***	(12.57)	1.07***	(16.77)
PDOLS 4	1.06***	(16.30)	0.88***	(4.77)	1.16***	(14.41)	1.17***	(15.95)
				Real				
PDOLS 1	0.98***	(22.39)	0.98***	(13.99)	1.03***	(16.96)	0.95***	(12.28)

[18] These results are available upon request from the authors.

PDOLS 2	0.90***	(22.08)	0.86***a	(20.70)	0.89***	(11.57)	1.09***	(10.21)
PDOLS 3	0.73***a	(15.26)	0.63***a	(8.42)	0.72***a	(8.44)	0.83***	(9.73)
PDOLS 4	0.76***a	(14.98)	0.63***a	(8.37)	0.74***a	(9.65)	0.97***	(9.65)
Nominal to GDP								
PDOLS 1	0.86***	(8.12)	0.39*a	(1.71)	1.05***	(5.65)	0.93***	(8.94)
PDOLS 2	0.79***	(7.50)	0.45**a	(2.33)	1.02***	(5.44)	1.05***	(7.87)
PDOLS 3	0.65***a	(10.07)	0.42***a	(3.74)	0.70***a	(8.81)	0.86***	(9.77)
PDOLS 4	0.65***a	(10.26)	0.37***a	(3.41)	0.72***a	(10.09)	0.89***	(10.55)
Real to GDP								
PDOLS 1	0.74***a	(12.21)	0.66***a	(8.64)	0.67***	(4.30)	0.84***	(8.92)
PDOLS 2	0.64***a	(10.11)	0.60***a	(7.53)	0.59***a	(5.21)	0.90***	(6.71)
PDOLS 3	0.60***a	(10.58)	0.55***a	(6.63)	0.53***a	(4.98)	0.75***	(6.85)
PDOLS 4	0.62***a	(10.83)	0.55***a	(6.83)	0.55***a	(5.87)	0.86***	(7.17)

Notes: ***, **, * mean that the coefficient is respectively different to zero at 1%, 5% and 10% levels. The t-statistics related to estimated coefficients are in parentheses. The letter "a" denotes coefficients that are also significantly different to one (1) at 1% level.

4.2. How robust is the relationship between exchange rate regimes and current account sustainability?

The results previously presented do not control for the effects of other variables beyond exchange rate regimes that might affect current account sustainability. For SSA countries, one particular concern is accounting for the effects of the HIPC initiative that IMF and the World Bank have established in 1996 in order to reduce the overall debt of eligible countries at a sustainable level. Indeed, among the 44 SSA countries of our panel, 28 countries were eligible for the HIPC initiative while the remaining 16 have not taken part to this program.[19] Thus, it seems important to consider whether that initiative has had a positive impact on the level of sustainability of the current account for the recipient countries and may have influenced our previous results. It might be the case if the countries benefiting from this initiative had belonged mainly to a flexible exchange rate regime compared to other regimes.

To this end, we first check the distribution of exchange regimes across the recipient countries in order to analyze the sensitivity of our previous results to the HIPC initiative. The recipient countries of our sample represent the same proportion in the total of countries belonging to a flexible exchange regime or a fixed exchange rate regime (respectively, 69 and 67 percent).[20] Thus, our previous findings seem to be robust to the effects of the HIPC initiative. The higher sustainability of current accounts in countries with more flexible exchange regimes seems to be linked with the nature of the exchange rate regime and in particular the possibility of adjusting the nominal exchange rate in flexible exchange regimes. We then investigate current account sustainability before and after the HIPC initiative for all recipient countries, and test if the sustainability level has changed with its implementation. Nevertheless, as the "before-after" analysis carried out only on recipient countries may be insufficient given that other factors not related to the HIPC initiative could be at play, we perform the same analysis on the non-eligible countries. These can be regarded as "comparator countries" or "reference

[19] See countries list in Table A.2 in Appendix. Some countries did not participate in the HIPC Initiative by political choice while others did not meet the eligibility criteria or have not implemented the necessary reforms.
[20] See table A.2 in the appendix.

countries" given that—except the HIPC initiative—they have similar structural characteristics to recipient countries.

The estimation results are summarized in Table 4 and clearly show that the HIPC initiative has significantly contributed to improving the level of external sustainability of recipient countries. Indeed, while the current account of the beneficiary countries was weakly sustainable before the HIPC initiative, it appears strongly sustainable after HIPC whatever the model specification and the type of variables (nominal, real or as a percentage of GDP). This result is consistent with the stylized facts and many empirical studies have highlighted the economic difficulties (internal and external) in several SSA countries in the 1980s which have led some of them (especially countries with fixed exchange rate regime) to devalue their currency. Moreover, regarding the "reference countries", the results appear very mixed and depend on the model specification and the type of variables. Indeed, by considering specifications 3 and 4, the level of current account sustainability remains low before and after the HIPC initiative and has even deteriorated in most cases except when the real variables are retained. Considering the variables relative to GDP, results show that the level of current account sustainability has markedly deteriorated for "reference countries" especially when one considers nominal variables relative to GDP. Although these results are partly due to the price effect, they still show that countries that did not participate in the HIPC initiative have not fulfilled their intertemporal budget constraint in particular on the period after the HIPC initiative.

In the light of all the results presented here, we can conclude that the HIPC initiative has contributed significantly to improving the sustainability of the current account of the recipient countries, whatever their exchange rate regimes. Thus, the differences in current account trajectories seem not be explained by international policies on debt reduction, but rather by the characteristics of exchange rate regimes.

Table 4: Sustainability coefficient before and after HIPC initiative

Panel	**Recipient countries of the HIPC initiative**				**Countries not eligible for the HIPC initiative**			
	Before HIPC initiative		After HIPC initiative		Before HIPC initiative		After HIPC initiative	
	Coef.	t-stat	**Coef.**	t-stat	**Coef.**	t-stat	**Coef.**	t-stat
				Nominal				
PDOLS 1	0.86***	(12.22)	0.99***	(23.29)	0.99***	(20.97)	1.18***	(9.02)
PDOLS 2	0.86***	(11.80)	1.08***	(10.77)	0.94***	(14.14)	1.28***	(7.06)
PDOLS 3	0.77***a	(15.13)	1.14***	(10.51)	0.75***a	(8.40)	0.50***a	(3.26)
PDOLS 4	0.81***a	(13.91)	1.22***	(7.50)	0.77***	(6.24)	0.67***	(3.06)
				Real				
PDOLS 1	1.05***	(10.35)	0.86***	(14.09)	0.86***	(10.81)	0.87***	(12.40)
PDOLS 2	0.95***	(9.64)	0.99***	(9.07)	0.73***	(6.48)	0.88***	(9.86)
PDOLS 3	0.71***a	(9.73)	0.85***	(6.27)	0.36***a	(3.26)	0.62***a	(5.13)
PDOLS 4	0.71***a	(9.79)	0.90***	(6.40)	0.42***a	(3.90)	0.64***a	(5.69)
				Nominal to GDP				
PDOLS 1	0.83***	(10.14)	0.96***	(9.04)	0.82***	(10.25)	-0.05a	(-0.28)
PDOLS 2	0.83***	(9.31)	1.03***	(7.80)	0.81***	(10.39)	0.00a	(0.01)
PDOLS 3	0.77***a	(12.32)	0.81***	(5.65)	0.73***a	(7.32)	0.07a	(0.74)

PDOLS 4	0.77***a	(13.80)	0.78***	(5.08)	0.75***	(6.96)	0.12a	(1.38)
				Real to GDP				
PDOLS 1	0.65***	(4.11)	0.77***	(5.57)	0.69***	(4.64)	0.61***a	(6.34)
PDOLS 2	0.68***	(4.89)	0.90***	(5.13)	0.71***	(5.40)	0.62***a	(6.73)
PDOLS 3	0.57***a	(8.65)	0.70***	(5.13)	0.40***a	(3.25)	0.36***a	(2.82)
PDOLS 4	0.57***a	(8.47)	0.71***	(5.19)	0.46***a	(3.78)	0.39***a	(3.14)

Note: ***, **, * mean that the coefficient is respectively different to zero at 1%, 5% and 10% levels. The t-statistics related to estimated coefficients are in parentheses. The letter "a" denotes coefficients that are also significantly different to one (1) at 1% level.

Another important issue in the analysis of current account sustainability in SSA countries is the effect of specialization. Indeed, it is well known that oil producing countries are more likely to face significant external shocks due to volatility in their terms of trade. It is thus important to check whether the previous results are not skewed by the fact that most oil-producing countries have a fixed exchange rate regime. Accordingly, we have run several other estimations by groups of countries (fragile states, low-income countries, middle-income countries and oil-producing countries). Results are presented in Table A.5 in the Appendix and show that the issue of sustainability is more acute in fragile economies as well as oil-producing countries. To check whether the latter result does not affect our previous conclusions on the role of exchange rate regimes, we re-estimate the sustainability of the current account according to the exchange rate regime by excluding oil countries from the sample. The corresponding results presented in Table A.6 in the Appendix show that in three of four cases, depending on the type of variables, previous results do not change. Indeed, the sustainability of the current account is overall still lower for countries having a fixed exchange rate regime especially when we consider the most complete specifications (PDOLS3 and PDOLS4). However, the sustainability of the current accounts in the latter countries seems to be strong (i.e. the sustainability coefficients are not significantly different from 1) when nominal data relative to GDP are considered. But, on the whole, our previous conclusions remain robust to the countries' specialization and the level of development or fragility. In particular, they are not biased by the fact that most oil producing countries of our sample operate a fixed exchange rate regime. Our findings thus support that countries with flexible exchange rate regime are more likely to ensure the sustainability of their current account.

4.3. Explaining differences in levels of sustainability: current account adjustment

To strengthen our study of the nexus between current account sustainability and exchange rate regime, we now analyze the current account adjustment process. Following Friedman (1953), it is generally argued that flexible exchange rate regime allows facing external shocks and thus facilitating current account imbalances' absorptions. Broda (2004) found evidence that deep devaluations occurred in the 1980s in non-CFA countries mainly in response to a fall in their terms of trade. Consequently, this regime is expected to lead to faster current account adjustment than others. To test this assertion, we analyze the persistence of current account by estimating its first-order autocorrelation coefficient. A higher value for this coefficient indicates that a shock to the current account balance would be more persistent for the

considered groups of countries and vice versa. To estimate such an autocorrelation coefficient, we rely on the corrected Least Squares Dummy Variable (LSDVC) estimator initially developed by Kiviet (1995). To summarize, this method consists in subtracting an estimated value of a bias to the coefficients obtained by using fixed effect (within or LSDV) estimators (for more details, see Bun and Kiviet, 2003 and Bruno, 2005).[21] Table 4 below provides LSDVC estimation results of the current account persistence with and without net foreign assets (NFA) as a control variable.[22]

Table 5: Current account persistence

CA	All Ca		Fixe ca		Intermediate ca		Floating ca	
CA (-1)	**0.603*** **	**0.576*** **	**0.627*** **	**0.595*** **	**0.614*** **	**0.587*** **	**0.540*** **	**0.522*** **
	(0.024)	(0.024)	(0.038)	(0.039)	(0.044)	(0.045)	(0.047)	(0.047)
NFA		**0.016*** **		**0.018** **		**0.013*** **		**0.017*** **
		(0.003)		(0.007)		(0.004)		(0.006)
Obs.	1,364	1,364	558	558	403	403	403	403
Nb. of id	44	44	18	18	13	13	13	13

Note: Bootstrap standard errors obtained after 1000 replications are in parentheses, *** (resp. **, *): significant at 1% (resp. 5%, 10%) levels.

These findings clearly show that the adjustment of the current account occurs more rapidly under a flexible exchange rate regime. However, there is no major difference between fixed exchange rate and intermediate regimes. Indeed, under fixed or intermediate regimes, the autoregressive coefficient of the current account is around 0.60, higher than that obtained under a flexible regime (0.52). These results are consistent with the position of Friedman (1953) and recent empirical studies showing that current account imbalances in the euro area have strengthened since the introduction of the euro (Berger and Nitsch, 2010; Homes et al., 2010; Proaño et al., 2012 and Körner and Zemanek, 2013). Regarding studies on developing countries, our results are also consistent with those recently found by Mu and Ye (2013). Indeed, these authors use hazard models to examine the role of exchange rate regimes in the timing of current account adjustment for a panel of 95 developing countries and find that fixed exchange rate regimes increase the duration of high deficit spells and thus delay current account adjustment. As we have previously evidenced for sustainability, these authors show that this result is robust to a variety of model specifications and alternative classifications of exchange rate regimes.

[21] Unlike the LSDVC estimator, previous estimators for panel and dynamic panel data—namely within or LSDV, instrumental variable (IV) proposed by Anderson and Hsiao (1982), generalized method of moments (GMM) and System GMM respectively developed by Arellano and Bond (1991) and Blundell and Bond (1998)— could be severely biased and imprecise when the number of cross-sectional units is small (see Kiviet, 1995, Judson and Owen, 1999, Bun and Kiviet, 2003 and Bruno, 2005).

[22] Net foreign assets are an important determinant of the current account (see among others Chinn and Prasad, 2003; Decrassin and Stavrev, 2009 and Lane and Milesi-Ferretti, 2012). In addition, they are also used in the analysis of external sustainability to take into account the valuation effect induced by the exchange rate (see Camarero et al., 2010, 2013).

5. Conclusion

The aim of this paper is to investigate current account sustainability in Sub-Saharan Africa (SSA), by paying particular attention to the influence of exchange rate regime. We estimate the sustainability of current accounts by testing the existence of a cointegration relationship between exports and imports plus interest payments on external debt. To this end, we mobilize recent panel cointegration techniques on a sample of 44 SSA countries over the 1980-2011 period.

Our findings show that while the current account has been globally sustainable in SSA countries, the level of sustainability depends on the exchange rate regime. Specifically, we find that the level of current account sustainability increases with the degree of flexibility of the exchange rate regime—this result being robust to the introduction of additional variables which may affect the relationship between exchange rate regimes and current sustainability. Indeed, if the HIPC initiative launched in 1996 by the World Bank and the IMF has significantly improved the current account sustainability in the recipient countries, it doesn't affect the positive link between flexible exchange rates and sustainability. Our results also hold after controlling for differences in specialization and income, emphasizing the robustness of our findings.

Finally, we evidence that the difference in the level of sustainability across SSA economies could be explained by a higher persistence in the current account adjustment process of countries operating fixed exchange rate regimes. These results are consistent with the predictions of the optimum currency area theory (Mundell, 1961) and Friedman (1953), according to which countries with flexible exchange-rate regimes are more likely to adjust their current-account imbalances.

On the whole, the choice of the exchange rate regime appears decisive in the context of correcting external imbalances. This issue is important for SSA countries, in the perspective of forming monetary unions. Indeed, it seems desirable that candidates for membership of monetary union discuss widely about possible adjustment mechanisms before forming such union in order to avoid painful adjustments costs that could hinder their development process.

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APPENDIX

Table A.1: The fine classification by Ilzetzki, Reinhart and Rogoff (IRR) (2008)

Fine classification	**code**
No separate legal tender	1
Pre announced peg or currency board arrangement	2
Pre announced horizontal band that is narrower than or equal to +/-2%	3
De facto peg	4
Pre announced crawling peg	5
Pre announced crawling band that is narrower than or equal to +/-2%	6
De factor crawling peg	7
De facto crawling band that is narrower than or equal to +/-2%	8
Pre announced crawling band that is wider than or equal to +/-2%	9
De facto crawling band that is narrower than or equal to +/-5%	10
Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)	11
Managed floating	12
Freely floating	13
Freely falling	14

Our own classification	IRR's fine codes
Fixed exchange rate regime	1, 2, 3, 4
Intermediate exchange rate regime	5, 6, 7, 8, 9, 10, 11
Flexible exchange rate regime	12, 13, 14

Table A.2: Countries grouped by exchange rate regime

Fixed exchange rate regime	**Intermediate exchange rate regime**	**Flexible exchange rate regime**
Benin (b)		
Burkina Faso (b)		
Cote d'Ivoire (b)	Angola	South Africa
Guinea-Bissau (b)	Botswana	Congo, Dem. Rep. (b)
Mali (b)	Burundi (b)	Gambia, The (b)
Niger (b)	Cape Verde	Ghana (b)
Senegal (b)	Ethiopia (b)	Kenya
Togo (b)	Guinea (b)	Madagascar (b)
Cameroon (b)	Mauritania (b)	Malawi (b)
Central African Republic (b)	Mauritius	Nigeria
Chad	Mozambique (b)	Sierra Leone (b)
Congo, Rep. (b)	Rwanda (b)	Uganda (b)
Equatorial Guinea	Sao Tome and Principe (b)	Tanzania (b)
Gabon	Seychelles	Zambia (b)
Lesotho	Sudan	Zimbabwe
Namibia		
Swaziland		
Comoros (b)		
67% (b)	54% (b)	69% (b)

Note: Given that a country may have experienced several exchange rate regimes, the classification made takes into account the length of experience in the exchange rate regimes. Countries whose name is accompanied by the letter (b) are those who participated in the HIPC initiative.

Table A.3: Cross-sectional independence tests

Variables	Pesaran's test of cross-sectional dependence		Breusch-Pagan LM test of independence	
	Statistic	Prob	Chi2 (d)	Prob
Nominal	9.93	0.00	12433.60	0.00
Real	13.03	0.00	6889.41	0.00
Nominal to GDP	11.44	0.00	1210.80	0.00
Real to GDP	18.11	0.00	1304.76	0.00

Note: The null hypothesis is absence of cross-dependence. d=Nn* (Nn-1) /2 where Nn is the number of cross-sectional units.

Table A.4: Sustainability coefficient by monetary policy choice

Panel	Sub-Saharan countries (44)		Monetary union countries (18)		No Monetary union countries (26)	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
			Nominal			
PDOLS 1	1.16***a	(22.28)	1.25***a	(15.93)	1.08***	(18.85)
PDOLS 2	1.19***a	(19.37)	1.21***	(14.10)	1.18***a	(17.46)
PDOLS 3	1.01***	(21.46)	0.88***	(8.86)	1.07***	(20.51)
PDOLS 4	1.06***	(16.30)	0.87***	(4.84)	1.14***	(19.69)
			Real			
PDOLS 1	0.98***	(22.39)	0.97***	(14.71)	0.99***	(19.03)
PDOLS 2	0.90***	(22.08)	0.85***a	(21.56)	0.94***	(11.07)
PDOLS 3	0.73***a	(15.26)	0.63***a	(8.37)	0.75***a	(14.10)
PDOLS 4	0.76***a	(14.98)	0.63***a	(8.39)	0.81***a	(13.75)
			Nominal to GDP			
PDOLS 1	0.86***	(8.12)	0.40* a	(1.82)	0.99***	(9.34)
PDOLS 2	0.79***	(7.50)	0.43**a	(2.33)	1.02***	(8.21)
PDOLS 3	0.65***a	(10.07)	0.43***a	(3.89)	0.77***a	(12.78)
PDOLS 4	0.65***a	(10.26)	0.38***a	(3.57)	0.78***a	(13.62)
			Real to GDP			
PDOLS 1	0.74***a	(12.21)	0.65***a	(8.89)	0.78***	(9.60)
PDOLS 2	0.64***a	(10.11)	0.58***a	(7.69)	0.69***a	(7.06)
PDOLS 3	0.60***a	(10.58)	0.55***a	(6.66)	0.64***a	(8.24)
PDOLS 4	0.62***a	(10.83)	0.54***a	(6.84)	0.67***a	(8.28)

Note: A/ ***, **, * mean that the variable is respectively significant at 1%, 5% and 10% levels. The t-statistics associated with estimated coefficients are in parentheses. The letter "a" denotes coefficients that are also significantly different to one (1) at the 1% level.
B/ All countries with a fixed exchange rate regime belong to a monetary union except the Comoros. South Africa has a flexible exchange rate regime, but is also considered as belonging to a monetary union since it forms a Common Monetary Area (CMA) with Lesotho, Namibia and Swaziland.

Table A.5: Sustainability coefficient by country category

Panel	Fragile countries (9)		Low-income countries (15)		Middle-income countries (11)		Oil countries (8)	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
				Nominal				
PDOLS 1	0.82***a	(12.13)	1.17***	(8.34)	1.10***	(12.06)	1.25***a	(17.23)
PDOLS 2	0.80***	(8.25)	1.34***	(6.80)	1.10***	(11.49)	1.21***a	(17.29)
PDOLS 3	0.83***a	(13.84)	1.04***	(14.39)	1.00***	(13.07)	1.23***	(9.06)
PDOLS 4	0.90***	(13.45)	1.15***	(11.16)	1.14***	(13.54)	0.93***	(5.18)
				Real				
PDOLS 1	0.87***	(7.68)	1.15***	(12.01)	1.07***	(11.04)	0.91***	(25.25)
PDOLS 2	0.72***	(4.83)	1.14***	(10.42)	0.92***	(8.38)	0.85***a	(21.46)
PDOLS 3	0.63***a	(8.69)	0.82***	(8.36)	0.93***	(7.86)	0.67***a	(7.95)
PDOLS 4	0.73***a	(8.51)	0.96***	(7.58)	0.93***	(8.81)	0.63***a	(7.18)
				Nominal to GDP				
PDOLS 1	0.81***	(8.07)	1.01***	(4.70)	0.81***	(7.33)	0.75**	(2.94)
PDOLS 2	0.86***	(6.93)	1.04***	(4.05)	0.77***	(5.71)	0.58***a	(3.72)
PDOLS 3	0.88***	(13.41)	0.69***	(5.30)	0.81***	(7.10)	0.42***a	(4.21)
PDOLS 4	0.99***	(14.34)	0.70***	(5.59)	0.81***	(6.14)	0.42***a	(3.57)
				Real to GDP				
PDOLS 1	0.70***a	(8.01)	0.71***	(3.32)	0.94***	(13.52)	0.69***a	(8.69)
PDOLS 2	0.62***a	(6.45)	0.69***	(4.23)	0.78***	(4.45)	0.61***a	(6.66)
PDOLS 3	0.48***a	(5.97)	0.65***	(4.52)	1.00***	(5.87)	0.60***a	(6.67)
PDOLS 4	0.55***a	(5.95)	0.72***	(4.89)	1.01***	(6.19)	0.58***a	(6.23)

Note: A/ ***, **, * mean that the variable is respectively significant at 1%, 5% and 10% level. The t-statistics associated with estimated coefficients are in parentheses. The letter "a" denotes coefficients that are also significantly different to 1 at 1% levels.
B/Countries are categorized using the Regional Economic Outlook published by the International Monetary Fund.

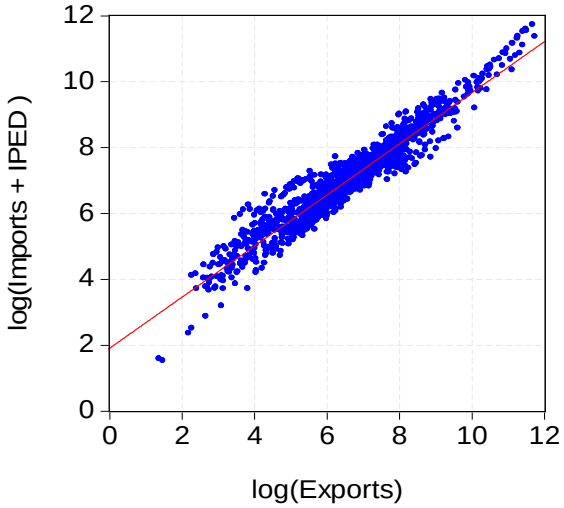
Table A.6: Sustainability coefficient by exchange rate regime (without oil-producing countries)

Panel	SSA countries (36)		Fixed Exchange rate regime (13)		Intermediate Exchange rate regime (11)		Flexible exchange rate regime (12)	
	Coef.	t-stat	**Coef.**	t-stat	**Coef.**	t-stat	**Coef.**	t-stat
				Nominal				
PDOLS 1	1.08***	15.75	1.20***	(7.27)	1.14***	(9.47)	0.96***	(14.78)
PDOLS 2	1.12***	13.38	1.13***	(4.51)	1.25***	(9.69)	1.10***	(11.30)
PDOLS 3	0.95***	24.07	0.74***a	(14.10)	0.90***	(10.75)	1.08***	(14.62)
PDOLS 4	1.04***	21.01	0.82***	(10.14)	1.06***	(12.22)	1.15***	(11.92)
				Real				
PDOLS 1	1.04***	15.97	1.52***	(7.04)	0.96***	(13.43)	0.98***	(12.73)
PDOLS 2	0.97***	12.87	1.36***	(5.51)	0.80***	(10.16)	1.13***	(10.74)
PDOLS 3	0.71***a	12.55	0.51***a	(5.92)	0.66***a	(8.37)	0.95***	(10.43)
PDOLS 4	0.78***a	12.24	0.56***a	(5.73)	0.74***a	(10.12)	1.08***	(10.98)
				Nominal to GDP				
PDOLS 1	0.92***	8.12	0.58**	(2.25)	0.98***	(4.12)	0.92***	(8.24)
PDOLS 2	0.90***	7.31	0.81**	(2.49)	0.99***	(3.96)	1.06***	(7.14)
PDOLS 3	0.82***a	13.28	0.98***	(7.70)	0.69***a	(6.75)	0.85***	(9.01)
PDOLS 4	0.84***	13.37	1.05***	(7.49)	0.71***a	(7.69)	0.89***	(9.46)
				Real to GDP				
PDOLS 1	0.74***a	7.59	0.77**	(2.55)	0.50***a	(3.28)	0.86***	(8.86)
PDOLS 2	0.66***a	6.62	0.93***	(3.48)	0.48***a	(4.30)	0.89***	(6.46)
PDOLS 3	0.55***a	7.35	0.50***a	(4.90)	0.35***a	(3.06)	0.84***	(7.05)
PDOLS 4	0.61***a	7.51	0.55***a	(4.95)	0.42***a	(3.51)	0.91***	(7.28)

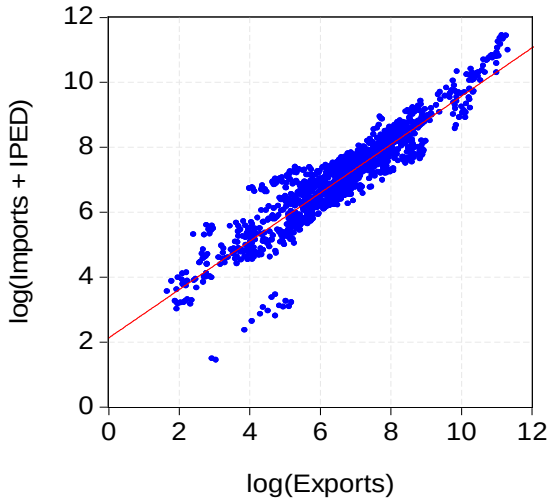
Notes: ***, **, * mean that the coefficient is respectively different to zero at 1%, 5% and 10% levels. The t-statistics associated with estimated coefficients are in parentheses. The letter "a" denotes coefficients that are also significantly different to one (1) at the 1% level.

Graph A.1: Relationship between Exports and Imports plus interest payments on external debts

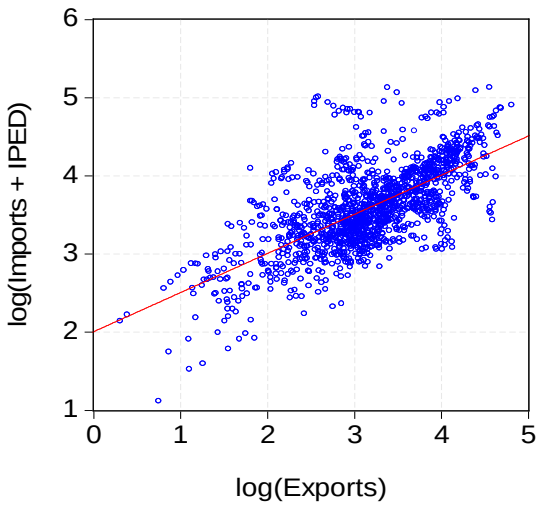
Exports and Imports + IPED (current dollars)



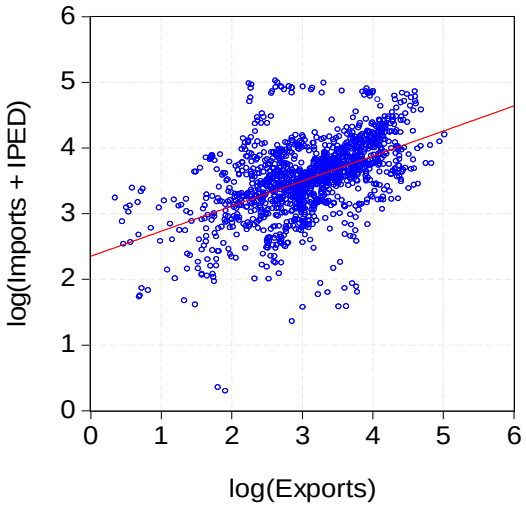
Exports and Imports + IPED (Constant dollars)



Exports and Imports + IPED (% current GDP)

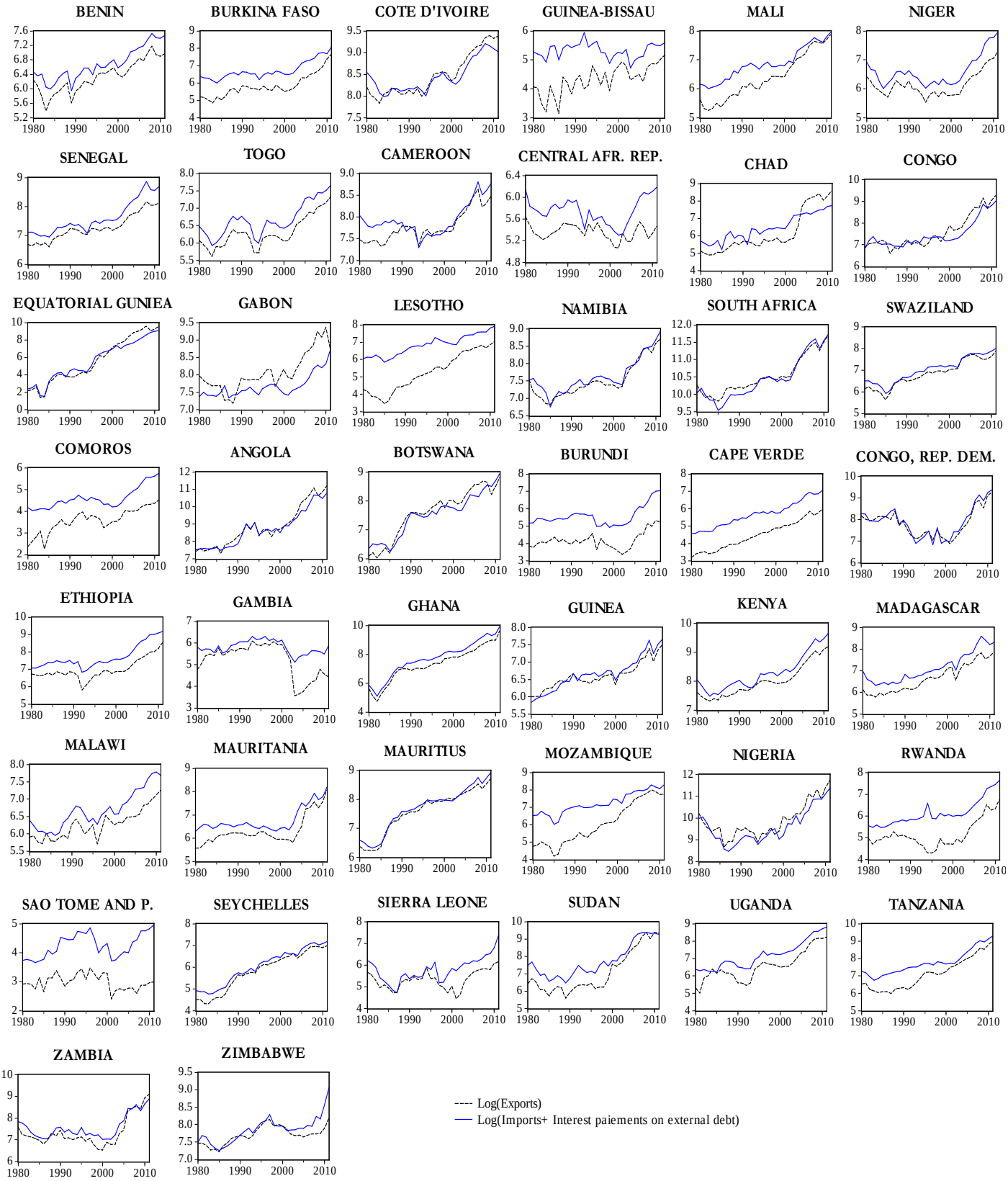


Exports and Imports + IPED (% constant GDP)

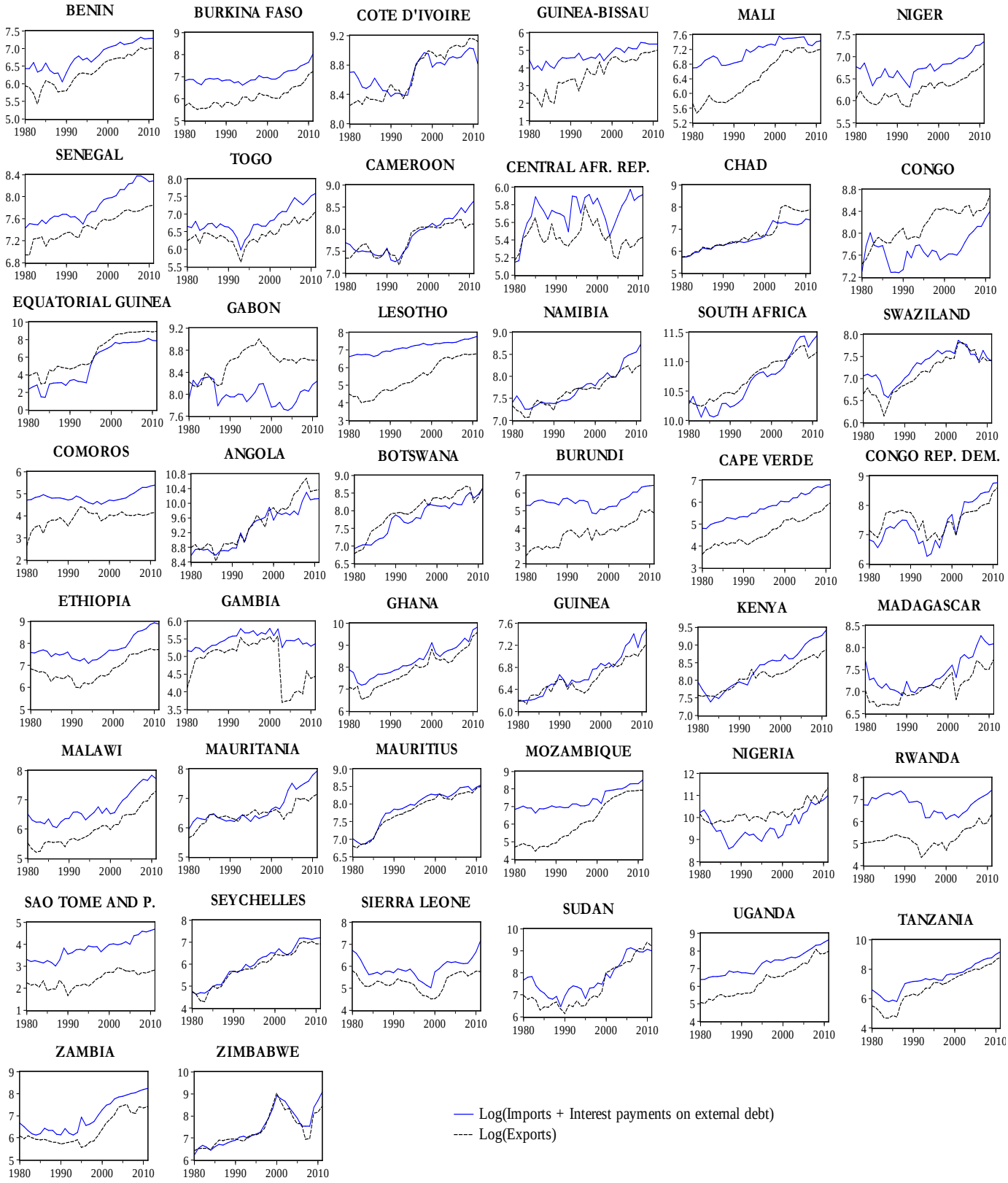


Note: IPED denotes Interest payments on external debt

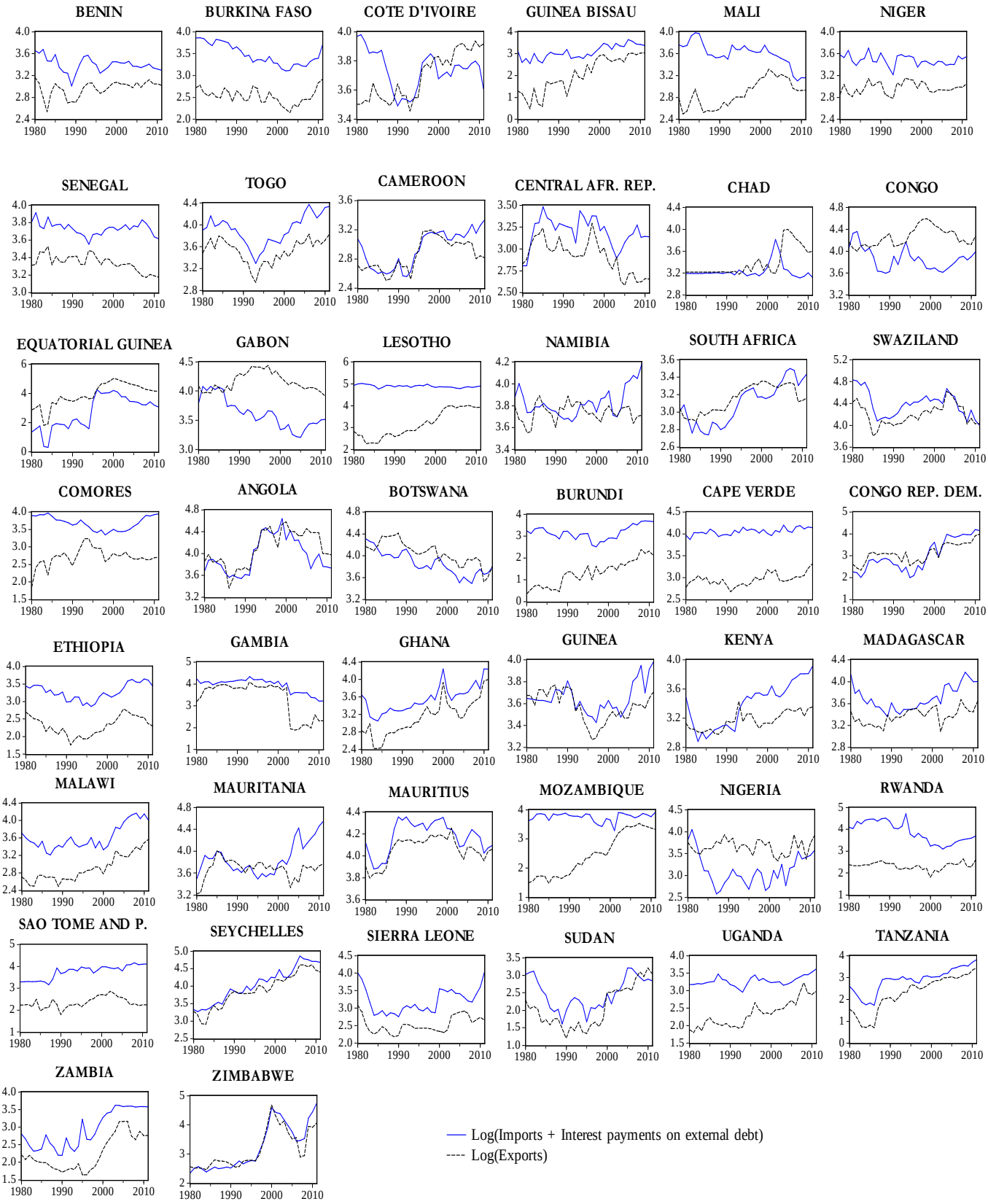
Graph A.2: Nominal variables



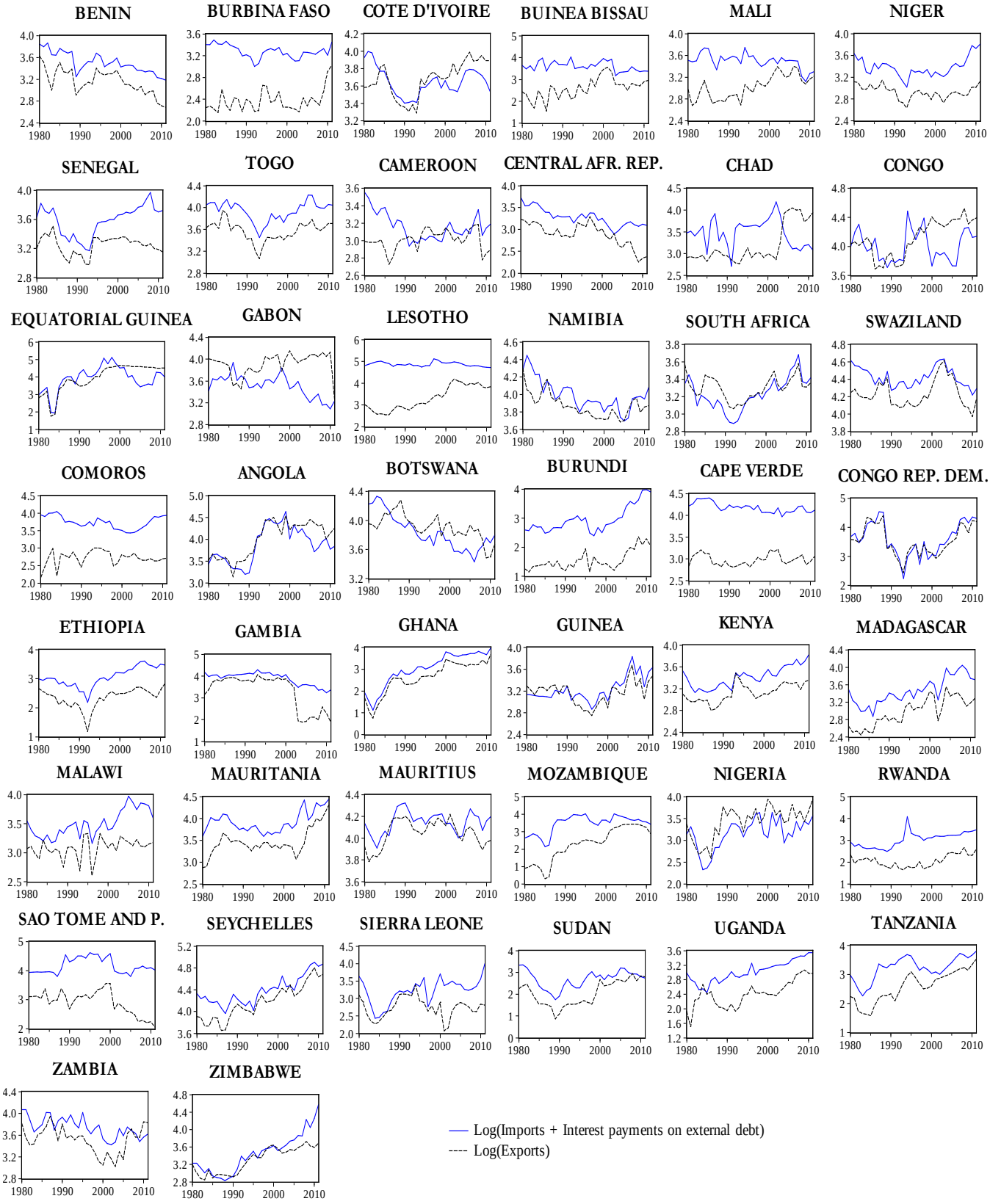
Graph A.3: Real variables



Graph A.4: Nominal variables relative to nominal GDP



Graph A.5: Real variables relative to nominal GDP



Graph A.6: Current account (% GDP)