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Economic Fluctuations in Sub-Saharan Africa

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Abstract

We compare business cycle fluctuations in Sub-Saharan African (SSA) countries vis-à-vis the rest of the world. Our main results are as follows: (i) African economies stand out by their macroeconomic volatility, which is is reflected in the volatility of output and other macro variables; (ii) inflation and output tend to be negatively correlated; (iii) unlike advanced economies and emerging markets (EMs), trade balances and current accounts are acyclical in SSA; (iv) the volatility of consumption and investment relative to GDP is larger than in other countries; (v) the cyclicality of consumption and investment is smaller than in advanced economies and EMs; (vi) there is little comovement between consumption and investment; (vii) consumption and investment are strongly positively correlated with imports.

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1 Introduction

In this paper we provide (i) an overview of some of the structural features of the economies of sub-Saharan Africa (SSA), and (ii) a systematic characterization of economic fluctuations in the region. For both sets of issues we compare the evidence for SSA with data from advanced, emerging, and other low–income countries.

In terms of economic structure, there are fundamental differences between the economies of rich and poor countries. These range from the share of agriculture in the economy, and the related weight of food expenditure in consumption, to the development of the financial system and access to international capital markets, and to the structure of production and the level of productivity and physical and human capital. These differences are even more pronounced for SSA relative to other low- and lower-middle-income countries.

Regarding economic fluctuations, we analyze the data for sub-Saharan Africa by looking at the variance and comovement of key macro variables, previously filtered to remove longer-term fluctuations (trends). This type of analysis has a long-standing tradition in modern macro, starting with the pioneering work of Prescott (1986), and has been used extensively in the real business cycle theory and so some extent in the new-Keynesian literature. While the macroeconomic literature has produced some papers on stylized facts concerning business cycle regularities in some emerging market economies (EMs) (see Agénor et al., 2000; Ahmed and Loungani, 2000; Rand and Tarp, 2002, among others), to our knowledge there is no such systematic analysis for Sub-Saharan Africa (SSA), nor one that compares the features of macroeconomic fluctuations of this group of countries with the rest of the world. The purpose of this paper is to fill this gap, though with the caveat that the poor quality of macroeconomic statistics in Africa may bias this analysis in a number of ways.

Our findings can be summarized as follows. First, African economies stand out by their macroeconomic volatility, reflected in the volatility of output and other macro variables. Second, inflation and output tend to be negatively correlated in SSA. Third, unlike advanced economies and EMs, trade balances and current accounts are acyclical. Fourth, the volatility of consumption and investment relative to GDP is larger than in other countries. Fifth, the cyclicality of consumption and investment is smaller than in advanced economies and EMs. Sixth, there is little comovement between consumption and investment. Seventh, consumption and investment are strongly positively correlated with imports.

Our review of structural features and other stylized facts provide some clues as to the features that may be behind these findings. To start, the greater volatility in SSA is indicative of large shocks, and equally important, of lack of mechanisms for dampening the effects of these shocks, such as greater economic diversification, financial sector development, or access to international capital markets. As to what those shocks may be, we see three main suspects: supply side, policy, and external.

The importance of supply side shocks can be inferred from the correlation of inflation and output and from the size and characteristics of the agricultural sector. Policy volatility can be inferred from the standard deviation of government consumption and government spending more generally. The possible role of external shocks can be inferred in part from the volatility of terms of trade and other balance of payments (bop) shocks, though the correlation between the former and output is not strong, and perhaps also from the volatility of the real exchange rate. Relatedly, the acyclicality of the trade balance is consistent with the limited access to international capital markets mentioned above, which also lends support to the view that shocks to the balance of payments, mainly stemming from the current account side, are behind the comovement between consumption/investment and imports.

A notable feature for SSA is the lack of strong comovement between consumption, investment, and GDP. In this sense, it could be argued that SSA economies do not have a clear business cycle, i.e., a common factor driving the dynamics of key macro variables. The above mentioned shocks could also help make sense of this finding if they affect specific sectors rather than the economy as a whole. In addition, the lack of strong comovement suggests that shocks coming from the financial sector play less of a role in these economies.[1]

Finally, our findings in this paper have important implications for monetary policy. The real nature of shocks in the region points to the limits of monetary-policy-based macro stabilization in SSA, and strengthen the need to focus monetary policy on the pursuit of price stability over the medium term. In addition, many of the structural features presented here need to be incorporated in the models used for policy analysis, in order to make those models relevant for SSA.

The remainder of the paper is structured as follows. Section 2 presents the data. Section 3 provides an overview of SSA economies. Section 4 discusses the empirical methodology for measuring economic fluctuations. Section 5 summa-

[1]Christiano et al. (2014) argue that shocks to the financial sector are necessary to replicate business cycle features in advanced economies, a key element of which is comovement.

rizes the empirical evidence. Finally, Section 6 discusses the results and concludes.

2 Data

We present summary statistics separately for SSA and for the rest of the world. As our comparison is meant to emphasize the role of economic development, we divide the latter group into: High-Income Countries, HIC; Upper Middle-Income Countries, UMIC; and Lower Middle-Income and Low-Income Countries, LLMIC.[2] In addition, given that for many SSA countries, natural resources are–or are projected to become–a major source of national income, we distinguish between resource-abundant and non-resource-abundant economies, using the classification employed in IMF (2012).[3] For each statistic we present the median value, though in some cases we also present box plots to give a sense of the distribution within each group.

Details on data sources and country coverage are provided in Tables A.1 and A.2 (Appendix A). We mainly rely on the publicly available databases of the IMF (International Financial Statistics and World Economic Outlook), the OECD (National Accounts) and the World Bank (World Development Indicators). We focus on annual data covering the period 1960-2007, to avoid contaminating our general conclusions from the peculiarities of the Great Recession (though with some exceptions). In terms of country coverage, we exclude "small states," given their unique economic characteristics (see IMF, 2014b). We also exclude countries with less than 30 years of uninterrupted data series. Data availability lead to the number of countries in each group reported in Table 1, with 109 countries in total. The SSA groups cover 31 countries, which is representative of the region (45 countries excluding South Africa). We exclude the latter given the size of its economy, level of income and emerging market (EM) status.

[2]We follow the World Bank/IMF classification, which has four groups: low-income: GDP per capita of US$1,005 or less; lower-middle income: US$1,006–$3,975; upper-middle income: US$3,976–US$12,275; and high-income: US$12,276 or more. The choice of combining lower middle-income and low-income countries into one group representative of poor countries is to have a sufficient number of countries with enough data availability in each group.

[3]A country is classified as resource-abundant if its resource revenue or resource exports are at least 20 percent of total fiscal revenue or exports, respectively in 2006-10.

Table 1: Number of Countries Covered in Each Group

Sub-Saharan Africa	
Resource-abundant	13
Non-resource-abundant	18
Non Sub-Saharan Africa	
HIC	34
UMIC	24
LLMIC	20

Table 2: Income per Capita (Median Values)

Country groups	GDP per Capita	GNI per Capita
	USD	
Sub-Saharan Africa		
Res.-abt	577.41	575.82
Non-res.-abt	300.56	334.15
Non Sub-Saharan Africa		
HIC	19350.19	18401.56
UMIC	2867.01	2772.19
LLMIC	929.75	894.11

Note: Res.-abt and non-res.-abt refer to resource-abundant and non-resource-abundant countries, respectively.
Source: Authors' calculations based on OECD and World Bank data.

3 An overview of SSA economies

An entire book would not suffice to document the many economic dimensions that set SSA African countries apart.[4] Our overview is therefore highly selective, with an emphasis on the issues that may matter for monetary policy.

3.1 Income and Growth

As seen in Table 2, the level of income per capital in the median SSA country is well below high- and middle-income countries, and even below other LLMICs. Overall, there is little variation within SSA, with only 2 countries (Botswana and Namibia) having income levels that are comparable to those in the middle-income group. As is well known in the growth literature, such a large income gap reflects large differences in human and physical capital accumulation, and the level of total factor productivity (Hall and Jones, 1999).

A related observation is that these economies have failed to converge to their higher income peers. Table 3 reports the median annual real per-capita output growth (and inflation rates) for the five country groups. SSA economies have grown on average, at a lower rate than countries in the other groups and have therefore become relatively poorer. Even in the more recent 1995–2007 period, in which SSA economies have performed much better than previously, growth was still lower than in the other groups.

Lack of convergence notwithstanding, there is a growing consensus that eco-

[4] A useful overview can be found in (Monga and Lin, 2015).

Table 3: Median Real Output Growth and Inflation Rates

	Real output (%)		Inflation - GDP Deflator (%)		Inflation - CPI (%)	
Country groups	Full sample	1995-2007	Full sample	1995-2007	Full sample	1995-2007
Sub-Saharan Africa						
Resource	0.57	1.58	7.23	8.41	6.82	6.13
Non-Resource	0.37	0.74	9.02	6.55	8.62	7.67
Non Sub-Saharan Africa						
HIC	2.58	2.15	5.48	2.78	5.13	2.19
UMIC	2.26	2.68	8.79	7.38	11.26	8.64
LLMIC	1.43	2.25	9.02	7.03	8.93	6.94

Source: Authors' calculations based on IMF, OECD and World Bank data.

nomic prospects have improved markedly in the region over the last two decades, albeit with variations across countries. Growth has increased, lifting a significant share of the population out of poverty (McKay, 2013). Associated with higher growth there has been an increase in measures of political stability and democracy, improved governance and macroeconomic policies (as can be inferred from the improved inflation performance seen in Table 3 and discussed in more detail by Berg and Portillo (2018)), an improved business environment, and the widespread adoption of new technologies (Radelet, 2010). A benign external environment also played a role, for example through high commodity prices that favored resource-abundant countries. It is interesting to observe however that growth has continued in the very recent period, even as external financial conditions have tightened, though limited to non-resource rich countries this time (IMF, 2016).

3.2 The Structure of SSA economies: The Supply Side

An important feature that sets SSA countries apart is the sectoral structure of their economy. Table 4 shows the shares of agriculture, services, and industry for the median country in each group, over the entire sample period. SSA countries have a much larger (smaller) share of agriculture (services) than their HIC and UMIC peers. Non–resource abundant countries in SSA also have lower industry shares than HIC, UMICs and other LLMICs. This evidence is consistent with the "structural transformation" view, which argues that poor countries, i.e., countries with lower overall productivity, allocate a large share of their factors of production to the agricultural sector to satisfy their basic subsistence needs. As productivity grows, demand for non-subsistence goods and services increase, and resources shift out of agriculture and into other sectors.[5]

[5]See Kongsamut et al. (2001) for a model-based exposition of the structural transformation hypothesis.

Table 4: GDP by Sectors (Median Values)

Country groups	Agriculture	Industry	Service	Total natural resources rents
		% of GDP		
Sub-Saharan Africa				
Res.-abt	30.27	28.89	43.04	14.37
Non-res.-abt	36.82	18.83	43.02	7.95
Non Sub-Saharan Africa				
HIC	2.90	30.00	67.20	0.66
UMIC	10.65	32.29	54.32	4.75
LLMIC	23.61	29.18	47.58	2.45

Note: Res.-abt and non-res.-abt refer to resource-abundant and non-resource-abundant countries, respectively.
Source: Authors' calculations based on OECD and World Bank data.

The share of employment allocated to agriculture is even larger than the share of agriculture in GDP, which is indicative of low levels of productivity and capital in that sector (see Mcmillan and Harttgen, 2015; Collier and Dercon, 2014, among others). One implication for monetary policy is that supply side shocks stemming from the agricultural sector are likely to be a dominant source of inflation volatility, while also playing an important role in output volatility. In addition, it can be argued that the degree of economy–wide price stickiness is lower in SSA, as prices of agriculture products adjust rapidly to changes in supply and demand. The mechanisms and the evidence are discussed extensively by Portillo et al. (2016); some of the stylized facts presented below are supportive of this view.

Finally, consistent with our classification, resource-abundant countries in SSA have a higher share of natural resource rents in percent of GDP, though non-resource rich SSA countries also receive sizable rents from that sector. The rent variable is defined as earnings from producing natural resources minus their cost of production. A related point is that exports from SSA countries consist mainly of commodities (either agricultural or mining products), with manufacturing playing a smaller role (IMF, 2015). It follows that these rents, which are highly sensitive to international commodity prices, are another source of volatility in these economies.

3.3 The Structure of SSA Economies: The Demand Side

Table 5 shows the components of aggregate demand in percent of GDP. SSA countries are similar to other low-income countries in terms of the relatively higher share of private consumption and the lower shares of government consumption and investment. These differences appear striking at first, as neo–classical growth theory would suggest higher investment shares in poorer countries, all else equal. One possible rationalization is again structural transformation: proximity to subsistence limits the ability to set resources aside for the future, and can result

Table 5: Demand Components in Percent of GDP (Median Values)

Country groups	Private consumption	Government consumption	Investment	Exports	Imports
			% of GDP		
Sub-Saharan Africa					
Resource-abundant	70.21	11.84	18.71	23.75	32.11
Non-resource-abundant	79.90	14.75	15.40	23.10	30.94
Non Sub-Saharan Africa					
HIC	57.00	18.17	22.57	30.10	29.48
UMIC	66.01	13.73	22.80	27.07	26.66
LLMIC	72.43	11.16	21.65	23.67	29.08

Source: Authors' calculations based on OECD and World Bank data.

in a higher consumption share at the expense of lower investment (Kraay and Raddatz, 2007). Similarly, the lower share of government consumption can be explained by the lower demand for "public" goods in an environment of relative near-subsistence (Mourmouras and Rangazas, 2008).

With regards to trade, Table 5 shows that both groups of SSA countries have sizable trade deficits on average, in the order of 7 percent of GDP. This differs markedly from high– and middle–income countries, which feature small trade surpluses, but coincides with other low–income countries. These deficits are widespread across SSA countries and have continued in the more recent period, as can be seen in the box plots in Figure (Figure 1). As will be shown below, this can be explained by the reliance on remittances and foreign aid in these countries. Given the capacity to fund imports through non debt–creating flows (or with debt set in concessional terms), it is not surprising that SSA countries also feature lower export shares. Unlike trade deficits, SSA countries vary considerably when looking at measures of openness, though without a clear pattern, as shown in Figure 1.

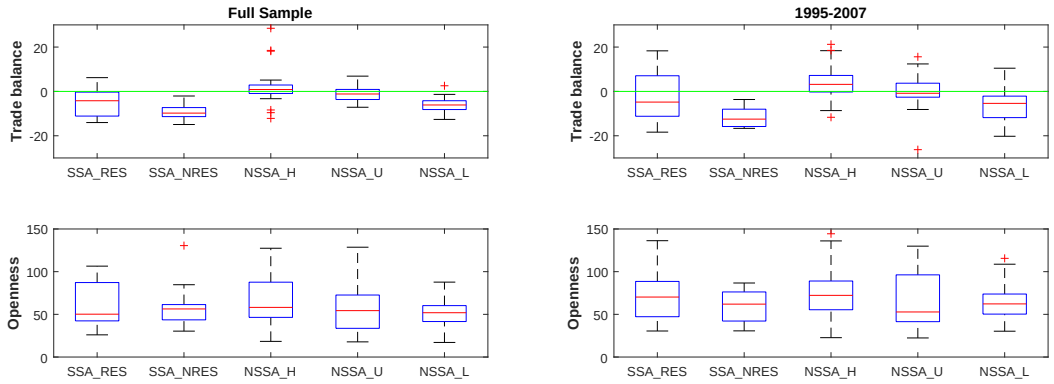
3.4 Financial Sector Development

Table 6 shows various indicators of financial sector development. Despite considerable improvement over the last two decades, credit to the private sector in percent of GDP—the most commonly used measure of financial sector development—is about 30 percentage points below the median value for UMICs, and about 20 percent lower than other LLMICs. The region also lags in two measures of access: ATMs and bank branches per 1000 adults. Lack of access to finance is pervasive for African households and firms, for example only 20 percent of firms have access to a bank loan or a line of credit, compared with 95 percent in advanced countries and 58 percent in other developing countries (Dabla-Norris et al., 2015).

Economists have long argued that financial development is good for growth

Figure 1: Box Plots of the Trade Balance and Openness to International Trade (% of GDP).

(a) Full Sample (b) 1995-2007



Notes: The trade balance is computed as exports/GDP minus imports/GDP. Openness is computes as exports/GDP plus imports/GDP. RES and NRES refer to resource-abundant and non-resource-abundant, respectively. H, U and L refer to HIC, UMIC and LLMIC, respectively.
Source: Authors' calculations based on OECD and World Bank data.

Table 6: Financial Sector Development (Median Values)

Country groups	Domestic credit to private sector	ATMs	Commerial bank branches
	% of GDP	Per 1 Million Adults	
Sub-Saharan Africa			
Res.-abt	18.08	6.86	4.68
Non-res.-abt	19.69	5.52	4.61
Non Sub-Saharan Africa			
HIC	110.96	74.29	20.14
UMIC	51.96	54.22	14.57
LLMIC	42.87	19.71	12.16

Note: Res.-abt and non-res.-abt refer to resource-abundant and non-resource-abundant countries, respectively.
Source: Authors' calculations based on OECD and World Bank data.

(Levine, 2005), though the global financial crisis has raised the question of whether there can be too much finance (Berkes et al., 2015). Shallow financial markets also have implications for macroeconomic volatility. Wang et al. (2016) argue that better access to credit markets implies that non–financial aggregate shocks have less impact on individual firms' investment decisions, with the latter being driven instead by idiosyncratic prospects. Similarly, households are also able to smooth their consumption if they have access to financial markets, the lack of which will make consumption more volatile. A related point is that incipient financial development also complicates the task of monetary policymakers by reducing the aggregate sensitivity to interest rate movements.

Table 7: Balance of Payment Indicators (Median Values)

Country groups	CA balance	Trade balance	Personal remittances	FDI net inflows	Net ODA	Volatility of TOT
			% of GDP			SD
Sub-Saharan Africa						
Res.-abt	-4.91	-4.31	0.79	2.61	8.64	38.59
Non-res.-abt	-6.12	-11.71	1.22	2.01	10.93	59.72
Non Sub-Saharan Africa						
HIC	0.56	0.94	0.34	1.91	0.30	19.15
UMIC	-1.86	-0.35	1.14	2.09	0.60	21.96
LLMIC	-2.01	-6.33	5.49	1.08	4.05	45.36

Source: Authors' calculations based on OECD and World Bank data.

3.5 The Balance of Payments, Capital Account Openness, and External Shocks

Table 7 shows selected components of the balance of payments across the five groups. Both SSA groups display a much larger share of aid flows (official development assistance or ODA) than HICs, UMICs, and even other LLMICs. Remittance flows appear relatively small, but this is a byproduct of using the entire sample period. Efforts to correctly measure remittance flows are more recent; focusing on the post-1995 period reveals much higher remittance shares in SSA, comparable to other LLMICs. The amount of FDI received by SSA countries is similar to other groups, with resource–rich countries receiving a slightly larger share. FDI in the former group has also been on the rise in recent years. The evidence suggests however that SSA countries have not been succesful at attracting large FDI flows despite their low capital base (and therefore high potential returns to investment).

We do not show portfolio and other investment flows for the sake of brevity. Our choice also reflects the limited integration in international capital markets in some SSA countries, due in part to restrictions on capital account transactions. Table 8 shows the index of *de jure* capital account openness compiled by (Schindler, 2009) and extended in (Fernandez et al., 2016). The index ranges from zero to one, with a higher number indicating greater restrictions. Non-resource-abundant countries in SSA have the highest degree of capital account restrictions, though other LLMICs are not too far behind. It is interesting to note that resource-abundant countries have the second lowest degree of *de jure* restrictions, perhaps reflecting efforts to attract external funding for mining projects.

The cross–country comparisons mask an increase in access to international capital markets in some SSA countries in recent years (IMF, 2014a). As of 2014, 10 countries other than South Africa had issued sovereign bonds in international jurisdictions. In some cases the sovereign bond has facilitated additional bond issuances by the corporate sector, for example in Nigeria. The volume of bonds

outstanding is very small, however (0.02 percent of the total stock), which points to limited appetite by foreign investors for SSA financial assets.

Finally, SSA countries also feature low levels of sovereign external assets and liabilities, in this case external debt and international reserves in percent of GDP (see Table 9 for 2015 numbers). The lower level of debt reflects inter-alia the considerable debt relief received by many countries in the context of the HIPC/MDRI initiative, efforts to limit excessive debt accumulation in IMF–supported programs, and the limited appetite for LIC debt mentioned above. Differences in the level of reserves are also consistent with different motives for reserve accumulation: self-insurance against large capital flow reversals in the case of UMICs, and EMs more generally, versus shocks to the current account in the case of SSA and LLMICs.

This brief overview of the bop helps identify what are likely to be the main sources of external shocks in SSA, which fall largely on the current account side. The commodity intensity of exports, and the volatility of international commodity prices, makes SSA countries highly vulnerable to exogenous changes in the terms of trade. This is confirmed in Table 7, which shows the volatility of the commodities terms of trade measure created by Spatafora and Tytell (2009) (hp–filtered, see discussion below).[6] Both groups of SSA countries face terms of trade that are more volatile than in HICs and UMICs. Aid flows are also quite volatile and thus constitute an additional source of external shocks (Bulir and Hamann, 2008). Remittances on the other hand seem to play a countercyclical, and hence volatility–reducing, role (Chami et al., 2008). Given limited access to international capital markets, shocks to capital flows are not as relevant in SSA as in EMs, although these have played a role in some countries more recently, as discussed for example by Berg et al. (2013) and Baldini et al. (2015). At the same time, limited integration also reduces the ability of residents to smooth the effects of domestic and external shocks, so that the overall effect on volatility is somewhat unclear.

[6]This terms–of–trade index uses price data on 46 commodities; for each country it weighs price fluctuations by the share of commodity exports and imports in GDP.

Table 8: De Jure Capital Account Openness (Median Values)

Country groups	Capital account overall restrictions index
Sub-Saharan Africa	
Res.-abt	0.23
Non-res.-abt	0.70
Non Sub-Saharan Africa	
HIC	0.09
UMIC	0.54
LLMIC	0.61

Note: Res.-abt and non-res.-abt refer to resource-abundant and non-resource-abundant countries, respectively.
Source: Authors' calculations based on dataset used in (Fernandez et al., 2016)

Table 9: Sovereign Assets and Liabilities (Median Values)

Country groups	Total reserves	External debt stocks
	% of GDP	
Sub-Saharan Africa		
Res.-abt	13.2	25.9
Non-res.-abt	11.9	32.8
Non Sub-Saharan Africa		
HIC	11.7	131.5
UMIC	20.1	38.6
LLMIC	18.1	30.7

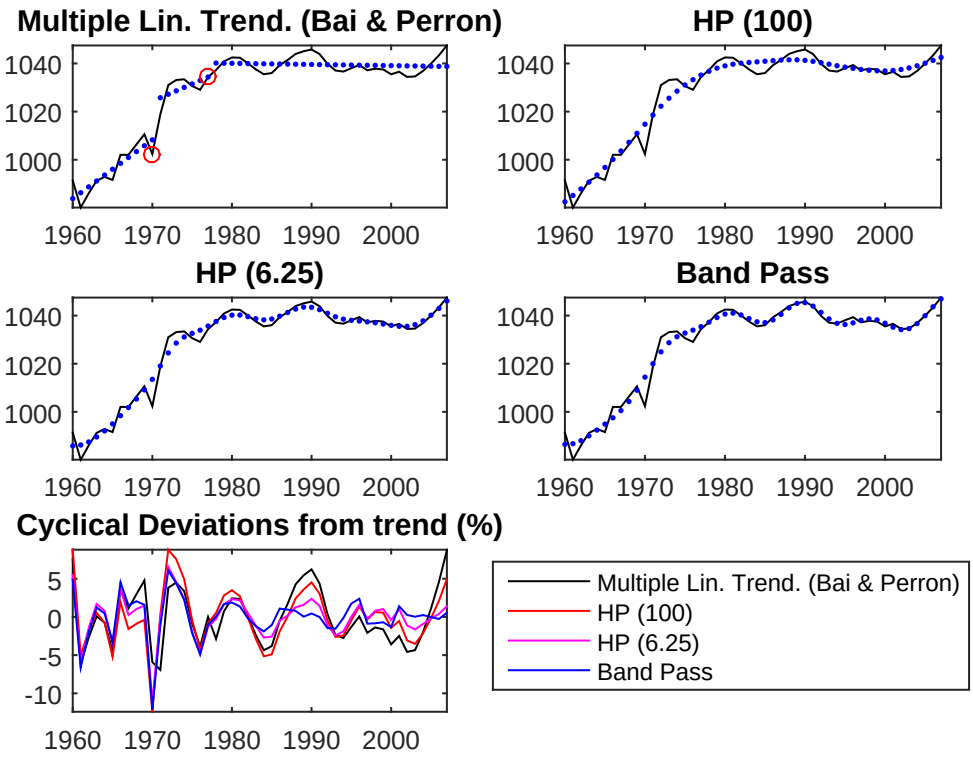
Source: Authors' calculations based on OECD and World Bank data.

4 Assessing the Stylized Facts of Economic Fluctuations: Methodological Issues

Producing statistics on the fluctuations of non-stationary macroeconomic variables requires the removal of trends. In the business cycle literature on both advanced economies and EMs there is no agreement on which is the most appropriate detrending methodology. A common procedure is the use of statistical fiters, though even then there is no consensus on which filter to use, or on the choice of parameters for any given filter (more on this below). Yet another approach is to simply focus on growth rates and their fluctuations, e.g. (Pritchett, 2000). The choice of technique is often part of a broader debate on whether economic fluctuations are the results of shocks to economic trends (or growth rates) (see Pritchett, 2000; Aguiar and Gopinath, 2007, among others), or whether they reflect temporary deviations around a more-or-less deterministic path (see Garcia-Cicco et al., 2010, among many others).

This methodological uncertainty applies to SSA countries. We do not take a stand on this debate. Instead, we search for stylized facts that are robust to the statistical procedure. Though we do not always show the results for the sake of brevity, we employ three popular detrending techniques: (i) the HP filter of Hodrick and Prescott (1997) with the conventional smoothing parameter $\lambda = 100$ for annual data; (ii) the Band-Pass (BP) filter recommended by Christiano and Fitzgerald (2003) identifying cyclical components with periods between two and eight years; and finally (iii) the first-difference (FD) filter. In addition, in our

Figure 2: Kenya's Log-Real-Per-Capita GDP: Smooth and Piecewise Linear Trends (HP and BP refer to the Hodrick-Prescott and the Band-Pass filters, respectively; Red circles represent trend break dates identified by the Bai and Perron (2003) test)



Source: Authors' calculations based on World Bank data.

applications, it turns out that smooth filters such as the HP and BP produce cyclical deviations with a strong comovement with deviations resulting from an application of piecewise linear trends exploiting break dates identified by a popular statistical test such as that of Bai and Perron (2003) (see, e.g. the case of Kenya's log-real-per-capita GDP in Figure 2).[7]

Table 10: Real Output - Median Volatility and Persistence

Country groups	Real output			
	Standard deviation (%)		Autocorrelation	
	Full sample	1995-2007	Full sample	1995-2007
Sub-Saharan Africa				
Resource-abundant				
HP	5.50	3.35	0.55	0.51
BP	2.94	1.82	-0.08	-0.07
FD	5.74	3.09	0.29	0.10
Non-resource-abundant				
HP	4.00	3.53	0.35	0.51
BP	2.91	2.04	-0.04	0.04
FD	4.93	4.28	-0.06	0.30
Non Sub-Saharan Africa				
High income				
HP	2.59	1.65	0.60	0.63
BP	1.44	0.83	0.12	0.18
FD	2.72	1.35	0.32	0.29
Upper-middle income				
HP	4.59	3.34	0.60	0.67
BP	2.63	1.94	0.12	0.19
FD	4.59	2.96	0.29	0.29
Low and lower-middle income				
HP (λ=100)	3.36	2.19	0.62	0.64
BP	1.98	1.21	0.10	0.10
FD	3.67	2.12	0.32	0.25

Note: HP and BP refers to the cyclical components of real per-capita output using the Hodrick-Prescott and the Band-Pass filters, respectively; FD refers to first differences of the logs of real per-capita output and the price levels.

Source: Authors' calculations based on IMF, OECD and World Bank data.

5 Business Cycle Dynamics

5.1 Output Volatility

Table 10 reports standard deviations and autocorrelation coefficients of detrended log real per-capita GDP. As regards output volatility, results change considerably across filters but the qualitative conclusions remain unaltered. In SSA, both the cyclical components of real GDP (HP and BP) and its rate of growth are more volatile than in the other country groups. The difference becomes even sharper when looking at resource abundant countries: in this group output is two times more volatile than in advanced economies and about 1.5 times more volatile than in non-SSA LLMIC. Across the board, volatility has decreased over the more recent sample (1995-2007), including in SSA, but the latter region still displays more volatility than the rest. The serial correlation of output varies considerably across filters but is generally weaker in SSA.

[7]Note that, for robustness, in Figure 2 we report also HP-filtered data with the correction more recently made by Ravn and Uhlig (2002), who suggest a $\lambda = 6.25$.

5.2 Volatility and Cyclicality of GDP Components

Getting more granular, in the spirit of the seminal work by Stock and Watson (1999) on the US, we compute the standard deviations of key macroeconomic variables relative to that of real output, and the dynamic correlations of real output with leads and lags of the same variables. This exercise allows us to assess how volatile macroeconomic aggregates are relative to GDP, whether they lead, lag or move approximately coincidentally with aggregate cycle, and whether there are significant differences across country groups. Results are reported in Tables 11 and 12.

SSA has the highest median relative volatility of private consumption: up to 1.5 times more volatile than output in resource abundant SSA, even if UMICs and other LLMICs also have consumption to output volatility ratios greater than one. Moreover, this aspect of economic fluctuations in SSA has not abated in the more recent period. A similar comparison emerges when looking at investment. Though it is well known that the latter variable is more volatile than GDP, SSA stands out again by the magnitude of its investment fluctuations. Both consumption and investment are procylical everywhere but the degree of procyclicality is much lower in SSA. We return to this weaker comovement in SSA below.

Government consumption is also more volatile in SSA than in HICs and UMICs, though comparable to other LLMICs. The higher policy volatility implied by this comparison is corroborated in Table 12, which shows the volatility of government spending and revenues. In the case of resource rich countries, fiscal policy has also become more volatile in the recent period. Government consumption (spending) displays relatively weak cyclicality everyhwere, with the exception of UMICs, while government revenues are procyclical everywhere (less so in resource rich African countries).

The picture for exports and imports is more mixed. Real exports in resource-rich SSA countries are less volatile and more procylical than in the other groups. This is consistent with: (i) mining production being less responsive to short-term developments and determined instead by longer-term factors, and (ii) lower degree of diversification in these economies. Exports in non-resource rich SSA are volatile and mildly procyclical, comparable in this regard to other LLMICs. Imports are as volatile in SSA as elsewhere, though the degree of cyclicality is somewhat less than in HICs and UMICs. The trade balance is only slightly more volatile in SSA, but stands out by the degree of acyclicality, compared with countercylical trade balances in HICs and UMICs. The differences in this

Table 11: Standard Deviations of Key Macroeconomic Variables relative to that of Real Output and Correlations of Real Output with Leads and Lags of the Same Variables (Detrending Method: HP100)

	Sub-Saharan Africa								Non Sub-Saharan Africa											
	Resource				Non-Resource				HIC				UMIC				LLMIC			
	SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$		
		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$
Private consumption	1.24	0.41	0.47	0.18	1.48	0.32	0.67	0.19	1.02	0.47	0.70	0.40	1.17	0.38	0.74	0.44	1.10	0.22	0.64	0.20
	1.62	*0.30*	*0.39*	*0.17*	*1.54*	*0.40*	*0.54*	*0.31*	*1.10*	*0.54*	*0.70*	*0.42*	*1.27*	*0.39*	*0.75*	*0.42*	*1.37*	*0.45*	*0.59*	*0.27*
Government consumption	2.62	0.18	0.22	0.11	3.35	0.19	0.34	0.08	1.40	0.28	0.21	-0.10	1.97	0.45	0.47	0.22	2.98	0.23	0.43	0.21
	4.65	*0.32*	*0.20*	*-0.23*	*3.26*	*0.25*	*0.21*	*0.05*	*1.32*	*0.32*	*0.18*	*-0.07*	*1.84*	*0.64*	*0.51*	*0.37*	*3.30*	*0.05*	*0.21*	*0.10*
Investment	4.41	0.21	0.34	0.25	5.28	0.09	0.33	0.28	3.90	0.43	0.80	0.45	3.56	0.39	0.74	0.41	4.75	0.32	0.64	0.43
	4.87	*-0.09*	*0.03*	*0.19*	*6.31*	*0.06*	*0.39*	*0.27*	*3.30*	*0.45*	*0.85*	*0.57*	*3.49*	*0.48*	*0.79*	*0.54*	*4.84*	*0.35*	*0.61*	*0.39*
Exports	2.58	0.16	0.52	0.43	3.63	0.02	0.34	0.26	2.87	0.14	0.41	0.19	3.09	0.17	0.31	0.19	3.80	0.22	0.31	0.29
	3.81	*-0.03*	*0.45*	*0.15*	*4.60*	*0.03*	*0.19*	*0.27*	*3.45*	*0.20*	*0.62*	*0.54*	*3.19*	*0.18*	*0.12*	*0.25*	*3.22*	*0.18*	*0.46*	*0.31*
Imports	3.01	0.18	0.34	0.24	3.15	0.15	0.37	0.29	3.23	0.29	0.51	0.27	3.02	0.36	0.55	0.38	3.80	0.21	0.37	0.33
	4.19	*0.17*	*0.24*	*0.27*	*4.01*	*0.15*	*0.31*	*0.35*	*3.70*	*0.41*	*0.69*	*0.45*	*2.73*	*0.33*	*0.70*	*0.52*	*4.03*	*0.34*	*0.60*	*0.29*
Trade balance	0.89	0.01	0.02	0.08	0.81	-0.06	-0.05	0.02	0.64	-0.22	-0.34	-0.05	0.74	-0.21	-0.35	-0.12	0.81	-0.06	-0.09	-0.08
	1.57	*0.00*	*0.06*	*-0.13*	*0.85*	*-0.10*	*-0.16*	*-0.11*	*0.70*	*-0.13*	*-0.20*	*-0.05*	*0.77*	*-0.38*	*-0.55*	*-0.22*	*0.98*	*-0.34*	*-0.24*	*-0.13*

Source: Authors' calculations based on IMF, OECD and World Bank data.
Notes: For each variable, the cross-sectional median within the country group is reported; the first line refers to the full sample, while the second line refers (in italic) refers to the more recent subsample (1995-2007). SD refers to the standard deviation of each marcoeconomic variable relative to that of real output, while $corr\,(y_t, x_{t+i})$denotes the correlation between real output (y_t) and leads and lags of each variable x_{t+i}.

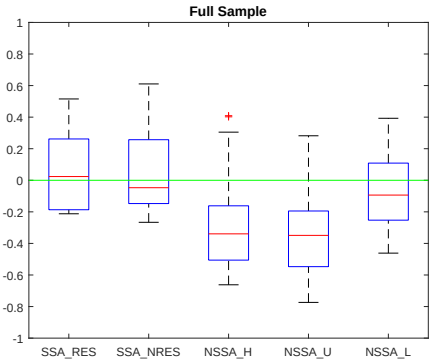
Table 12: Standard Deviations of Key Macroeconomic Variables relative to that of Real Output and Correlations of Real Output with Leads and Lags of the Same Variables (Detrending Method: HP100)

	Sub-Saharan Africa								Non Sub-Saharan Africa											
	Resource				Non-Resource				HIC				UMIC				LLMIC			
	SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$			SD	$corr\,(y_t, x_{t+i})$		
		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$		$i=-1$	$i=0$	$i=1$
Total govt. expenditures	3.58	0.15	0.24	0.01	3.51	0.23	0.32	0.10	2.49	0.12	-0.04	-0.04	2.44	0.24	0.51	0.27	3.21	0.31	0.29	0.21
	4.25	*-0.01*	*0.00*	*-0.05*	*3.28*	*-0.09*	*0.27*	*-0.05*	*1.69*	*0.16*	*-0.03*	*-0.15*	*2.32*	*0.32*	*0.55*	*0.30*	*3.47*	*0.42*	*0.48*	*0.14*
Total govt. revenues	3.03	0.19	0.35	0.18	4.00	0.23	0.58	0.17	2.60	0.35	0.42	0.22	2.13	0.36	0.57	0.42	3.48	0.20	0.38	0.35
	3.51	*0.19*	*0.23*	*-0.10*	*4.42*	*0.18*	*0.50*	*0.05*	*2.29*	*0.34*	*0.64*	*0.45*	*2.19*	*0.37*	*0.56*	*0.46*	*3.71*	*0.33*	*0.43*	*0.28*
Current account balance	0.74	-0.11	-0.11	0.06	1.04	-0.09	-0.09	0.01	0.67	-0.29	-0.33	-0.09	0.81	-0.39	-0.44	-0.13	0.92	-0.09	-0.14	-0.13
	1.21	*-0.03*	*0.01*	*-0.06*	*0.84*	*-0.11*	*-0.20*	*-0.03*	*0.74*	*-0.23*	*-0.21*	*-0.20*	*0.73*	*-0.38*	*-0.61*	*-0.39*	*1.02*	*-0.26*	*-0.30*	*-0.02*
Real eff. exchange rate	3.20	0.11	0.05	-0.16	3.24	0.17	-0.08	-0.18	2.39	0.11	0.05	-0.19	2.95	0.25	0.28	0.21	3.34	0.15	0.13	-0.04
	2.32	*0.23*	*0.24*	*-0.09*	*2.79*	*0.10*	*0.15*	*0.01*	*2.36*	*-0.31*	*-0.43*	*-0.40*	*2.35*	*0.26*	*0.15*	*0.11*	*2.84*	*0.33*	*0.25*	*0.22*
Terms of trade	5.42	0.01	0.11	0.19	7.91	-0.07	-0.05	-0.03	5.69	-0.06	-0.01	0.12	4.23	0.07	0.04	0.01	5.57	0.08	0.00	-0.01
	6.36	*0.18*	*0.26*	*0.29*	*9.03*	*0.05*	*0.00*	*-0.06*	*5.74*	*0.01*	*-0.09*	*0.07*	*3.97*	*0.17*	*0.09*	*0.08*	*7.47*	*0.17*	*0.07*	*-0.03*
Global output	0.22	0.14	0.19	0.16	0.30	0.12	0.09	0.18	0.47	0.16	0.48	0.37	0.28	0.02	0.11	0.01	0.35	-0.01	0.03	0.06
	0.24	*0.23*	*0.21*	*0.14*	*0.24*	*0.24*	*0.26*	*0.17*	*0.48*	*0.06*	*0.41*	*0.39*	*0.27*	*0.34*	*0.46*	*0.09*	*0.36*	*0.28*	*0.40*	*0.18*

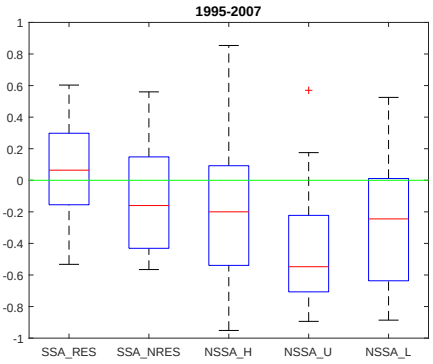
Source: Authors' calculations based on IMF, OECD and World Bank data.
Notes: For each variable, the cross-sectional median within the country group is reported; the first line refers to the full sample, while the second line refers (in italic) refers to the more recent subsample (1995-2007). SD refers to the standard deviation of each marcoeconomic variable relative to that of real output, while $corr\,(y_t, x_{t+i})$denotes the correlation between real output (y_t) and leads and lags of each variable x_{t+i}.

Figure 3: Box Plots of Correlations between Real Output and the Trade Balance. Detrending Method: HP(100)

(a) Full Sample



(b) 1995-2007



The trade balance is computed as exports/GDP minus imports/GDP. RES and NRES refer to resource-abundant and non-resource-abundant, respectively. H, U and L refer to HIC, UMIC and LLMIC, respectively. Source: Authors' calculations based on OECD and World Bank data.

correlation between SSA and the rest is quite stark, see Figure 3. A similar comparison emerges for the current account (see Table 12).

The volatility of SSA economies extends to their real effective exchange rates, as can be seen in Table 12. This is consistent with greater volatility in the terms of trade, which are reproduced in the same table, this time relative to GDP volatility. Both the real effective exchange rate and the terms of trade are approximately acyclical across all groups, although the latter variable has been somewhat more procyclical in resource rich countries in the more recent period.

Finally, we compute the correlation with a measure of global output across all groups (see Table 12). A striking finding is that SSA economies are much less synchronized with global output, with the lack of comovement persisting in the more recent period. We interpret this finding as reflecting a more limited global integration of SSA economies.

5.3 Comovement Across GDP Components

We now study the degree of correlation across GDP components (Table 13). These correlation stastistics complement the analysis of cyclicality; they can reveal whether fluctuations are driven by a common factor or, on the contrary, whether they are driven by component-specific shocks.

Unlike HICs and MICs, SSA countries stand out by the lack of comovement between consumption and investment. This comovement is typically considered one of the defining characteristics of business cycles, at least in advanced

Table 13: Correlations of Key Macroeconomic Variables (Detrending Method: HP100)

	Sub-Saharan Africa: Resource					
	Private Cons	Investment	Government Cons	Exports	Imports	Current Account
Private Cons	1					
Investment	0.11	1				
Government Cons	-0.07	0.11	1			
Exports	0.03	0.26	-0.05	1		
Imports	0.49	0.66	0.03	0.48	1	
Current Account	-0.38	-0.41	-0.20	0.27	-0.42	1

	Sub-Saharan Africa: Non-Resource					
	Private Cons	Investment	Government Cons	Exports	Imports	Current Account
Private Cons	1					
Investment	-0.16	1				
Government Cons	0.1	0.42	1			
Exports	-0.09	0.31	0.24	1		
Imports	0.36	0.63	0.18	0.56	1	
Current Account	-0.22	-0.51	-0.31	0.16	-0.27	1

	Non Sub-Saharan Africa: HIC					
	Private Cons	Investment	Government Cons	Exports	Imports	Current Account
Private Cons	1					
Investment	0.62	1				
Government Cons	0.22	0.06	1			
Exports	0.04	0.04	-0.25	1		
Imports	0.49	0.57	0.08	0.64	1	
Current Account	-0.57	-0.46	-0.35	0.27	-0.45	1

	Non Sub-Saharan Africa: UMIC					
	Private Cons	Investment	Government Cons	Exports	Imports	Current Account
Private Cons	1					
Investment	0.31	1				
Government Cons	0.18	0.36	1			
Exports	-0.2	0.05	-0.24	1		
Imports	0.42	0.80	0.22	0.61	1	
Current Account	-0.53	-0.66	-0.41	0.33	-0.57	1

	Non Sub-Saharan Africa: LLMIC					
	Private Cons	Investment	Government Cons	Exports	Imports	Current Account
Private Cons	1					
Investment	0.18	1				
Government Cons	0.04	0.28	1			
Exports	-0.00	0.23	-0.01	1		
Imports	0.50	0.63	0.05	0.64	1	
Current Account	-0.33	-0.57	-0.24	0.01	-0.48	1

Source: Authors' calculations based on IMF, OECD and World Bank data.
Notes: For each variable, the cross-sectional median within the country group is reported

economies; its absence in the case of SSA is puzzling. As in other regions, both consumption and investment are positively (negatively) correlated with imports (the current account). Finally, the correlation between private and government consumption is generally weaker in SSA; while the correlation between investment and government consumption is weak in resource rich SSA and strong in non-resource rich.

Table 14: Inflation - Median Volatility and Persistence

Country groups	Inflation - GDP Deflator				Inflation - CPI			
	Standard deviation (%)		Autocorrelation		Standard deviation (%)		Autocorrelation	
	Full sample	1995-2007	Full sample	1995-2007	Full sample	1995-2007	Full sample	1995-2007
Sub-Saharan Africa								
Resource-abundant								
HP	8.14	6.14	0.03	0.04	5.94	3.14	0.14	-0.01
BP	7.05	5.03	-0.21	0.00	5.12	3.01	-0.16	0.00
FD	9.33	6.38	0.26	0.12	7.15	3.52	0.48	0.14
Non-resource-abundant								
HP	7.73	7.81	0.01	-0.13	6.83	4.80	0.08	0.16
BP	7.11	6.45	-0.22	-0.26	5.77	4.57	-0.18	-0.02
FD	9.42	7.75	0.35	-0.01	8.54	6.13	0.32	0.27
Non Sub-Saharan Africa								
High income								
HP	2.43	1.07	0.31	0.19	2.25	0.82	0.46	0.36
BP	1.99	1.08	-0.03	0.06	1.54	0.68	0.11	0.23
FD	4.50	1.45	0.79	0.40	4.01	0.86	0.84	0.40
Upper-middle income								
HP	6.63	4.05	0.05	0.15	5.24	3.78	0.33	0.42
BP	6.00	4.25	-0.11	0.08	3.52	2.55	0.06	0.12
FD	9.72	6.04	0.41	0.28	8.48	5.62	0.65	0.65
Low and lower-middle income								
HP	5.33	4.33	0.06	0.05	4.91	3.13	0.22	0.14
BP	4.50	4.26	-0.15	-0.21	4.30	2.49	-0.01	-0.03
FD	6.57	3.62	0.42	0.17	7.56	3.43	0.59	0.36

Note: HP and BP refers to the cyclical components of the GDP-deflator and CPI inflation rate using the Hodrick-Prescott and the Band-Pass filters, respectively; FD refers to first differences of the logs of the price levels, i.e. the inflation rate itself.
Source: Authors' calculations based on IMF, OECD and World Bank data.

5.4 Inflation and its Relation with Output Fluctuations

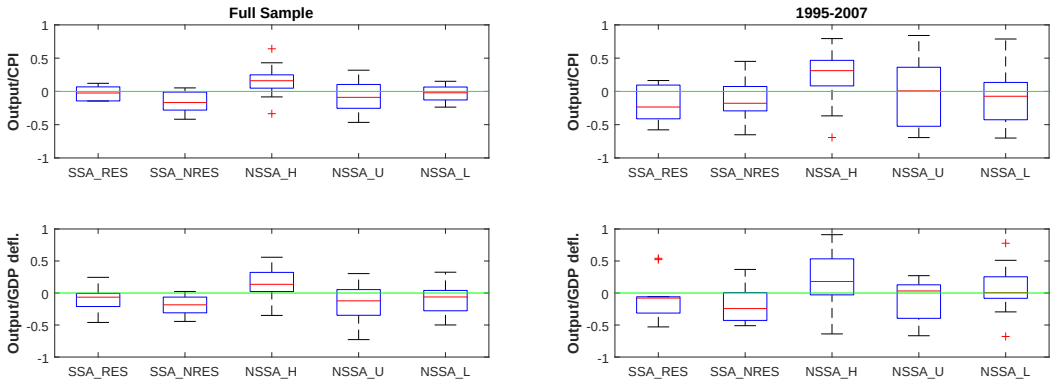
We turn next to inflation. Table 14 includes two inflation measures across our five groups: inflation based on variations in the consumer price index and in the GDP deflator. Overall, inflation in SSA countries is more volatile than in their peers. GDP deflator-based inflation is especially volatile, consistent with the volatile terms of trade discussed earlier.[8] Inflation persistence (measured by the autocorrelation of the variable) is highest in HIC and smaller anywhere else; it falls as we move from the richest to the poorest group, and it is smallest in non-resource-abundant SSA economies. As it was the case for output, inflation volatility has declined across the board in the more recent subsample.

But how does inflation relate with output fluctuations? The answer to this question heavily depends on the income group. In Figure 4, we report box-plots of correlations between the cyclical deviations of output and inflation. An interesting pattern that stands out from the figure is that while output correlates positively with inflation in HIC, the correlation falls–and turns negative–as we move to poorer country groups. In particular, in virtually all SSA countries this correlation is systematically negative. Although such a finding does not imply that aggregate demand shocks are not at play in SSA or LLMIC, it may be an

[8]The difference between the GDP deflator and the consumer price index partly reflects movements in (some of the components of) the terms of trade.

Figure 4: Box Plots of Correlations between Real Output and Inflation Rate (CPI and GDP deflator based). Detrending Method: HP(100)

(a) Full Sample (b) 1995-2007



Notes: RES and NRES refer to resource-abundant and non-resource-abundant, respectively. H, U and L refer to HIC, UMIC and LLMIC, respectively.
Source: Authors' calculations based on IMF, OECD and World Bank data.

indication of a dominance of aggregate supply shocks.

5.5 Is Volatility Related to Growth and Inflation Performances?

We conclude our data comparison by returning to Table 3, which also reports the inflation rates for the median country in the five country groups. SSA countries have experienced inflation rates that are comparable in magnitude to UMICs and other LLMICs in the rest of the world. While in the rest of the world inflation has dropped significantly in the recent subsample, in SSA the drop was more modest. In the case of resource rich countries, deflator-based inflation increased during the more recent sample, though this is mainly a reflection of large improvements in the terms of trade in those countries. Overall, the significant drop in output and inflation volatility observed in SSA and poorer economies has gone in tandem with improved output growth and inflation performances.

6 Conclusions and Discussion

In this paper we have provided an overview of economic fluctuations in SSA. We can summarize the above evidence as follows:

(i) African economies stand out by their macroeconomic volatility, which is is

reflected in the volatility of output and other macro variables.

(ii) Inflation and output tend to be negatively correlated in SSA countries.

(iii) Unlike advanced economies and EMs, trade balances and current accounts are acyclical in SSA.

(iv) The volatility of consumption and investment relative to GDP is larger than in other countries

(v) The cyclicality of consumption and investment is smaller than in advanced economies and EMs.

(vi) There is little comovement between consumption and investment.

(vii) Consumption and investment are strongly positively correlated with imports.

Drawing in part on the recent academic literature on business cycles, we discuss a possible interpretation of the above evidence.

The greater volatility in SSA is indicative of large shocks, and of lack of mechanisms for dampening the effects of these shocks, most notably lack of economic diversification and financial sector development. At the same time, the macroeconomic volatility is somewhat shorter-lived. One possible interpretation is that the lack of mechanisms mentioned above forces the economy to adjust more rapidly. A clear example is (lack of) access to financial markets, which reduces consumption smoothing and hence also reduces consumption persistence. Another possible interpretation is that the shocks that drive output tend to have temporary effects, e.g., supply shocks stemming from weather-related disruptions. A third interpretation is that measurement error is white noise, which all else equal would tend to reduce output persistence.

The acyclicality of the trade balance and the current account is consistent with limited access to international capital markets, or more generally with the presence of externally-imposed borrowing constraints on these economies. To the extent that access to international capital markets helps dampen the effects of domestic and external shocks, limited access can also help understand why SSA economies are so volatile. Moreover, movements in the external borrowing constraint can also be a source of external shocks, as argued for the case of Zambia by Baldini et al. (2015).

One possible interpretation for the lack of strong comovement between consumption and investment is that these economies do not have a standard business cycle, in the sense of a common factor driving the dynamics of most macro variables. The lack of comovement can instead reflect the predominance of sector-specific shocks, i.e., shocks that affect consumption and investment separately. These shocks could be domestic or external in nature. Another possibility is that variable-specific measurement error is more pervasive in these economies, which would tend to reduce comovement, all else equal. The measurement error hypothesis begs the question however of why there is comovement between consumption/investment and imports.

As regards the main drivers of economic fluctuations in SSA, our analysis of the data has identified three possibly-relevant sources of shocks in SSA: supply side, policy, and external. The likely importance of supply side shocks can be inferred from the correlation of inflation and output and from the size and characteristics of the agricultural sector. The role of policy volatility can be inferred from the standard deviation of government consumption and government spending more generally. The possible role of external shocks can be inferred in part from the volatility of terms of trade and other bop shocks, though the correlation between the former and output is not as strong in SSA as our priors would have predicted. The large volatility of the real exchange rate is another possible indication of the magnitude of external shocks. These shocks tend to affect specific sectors, which would also help explain the lack of comovement. Not all external variables seem relevant for economic fluctuations in Africa, as can be seen for example in the weak correlation between SSA country growth and global growth.[9]

We also see less evidence that shocks are coming from the financial sector. Models where developments in the financial system are an important source of economic fluctuations typically generate comovement by simultaneously relaxing borrowing constraints for households and firms (see Christiano et al. (2014) and Benes et al. (2014)). If access to finance is limited however, then there is less scope for comovement through this channel. A related point is that lack of financial sector development would limit the opportunities for smoothing sector-

[9]There is some debate in the literature as to whether external shocks are an important source of fluctuations in low–income countries. For example, Easterly et al. (1993) show that an important part of the variation in growth rates across countries can be explained by terms of trade, whereas Raddatz (2007) argues instead that external shocks (terms of trade, aid, global growth, and various types of disasters) explain only a small fraction of the volatility of output in LICs.

specific shocks and could therefore result in more volatile and less-synchronized spending decisions.

The volatility of consumption relative to output has been used as a litmus test for assessing the relevance of various shocks in the open economy real business cycle framework. Aguiar and Gopinath (2007) argue that a ratio greater than one indicates that shocks to trend output are the dominant source of volatility in EMs, hence their expression that "the cycle is the trend." Although it may be the case that trend shocks are also dominant in SSA, and developing countries more generally, as argued for example in Pritchett (2000), the mechanism put forward in Aguiar and Gopinath (2007) requires access to international capital markets and must go hand in hand with a countercyclical trade balance. This is not consistent with evidence for SSA.[10]

An alternative hypothesis has been put forward by Garcia-Cicco et al. (2010). These authors look at macro data (in first differences) for Argentina and Mexico going back to 1900. The economic fluctuations in those countries share some similarities with our SSA sample, in that consumption is more volatile than output, and the trade balance is acyclical vis-a-vis output but comoves negatively with both consumption and investment. They argue that this is consistent with limited availability of (and volatility in) external financing, as shocks to external financing create movements in consumption and investment that are also reflected in movements in the trade balance.[11] We suspect such a mechanism could also be at play in SSA countries. We leave a formal evaluation of these hypotheses for future work.

[10] Aguiar and Gopinath (2007) argue that productivity follows an autoregressive process in first differences, which implies higher/lower output today signals even higher/lower output in the future. When confronted with a postive shock, the rational response is for consumption to increase by more than output, which all else equal requires a increase in external indebtedness, and therefore a countercyclical trade balance. The mechanism is basically an open economy version of the permanent income hypothesis.

[11] Garcia-Cicco et al. (2010) also pay close attention to the autocorrelation function of the ratio of the trade balance to output, a statistic we do not analyze here.

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Appendix

A Data Sources and Country Coverage

Table A.1: Data Sources

Variables	Sources
GDP per capita	World Bank, World Development Indicators and OECD National Accounts
Gross capital formation	World Bank, World Development Indicators and OECD National Accounts
Government consumption expenditure	World Bank, World Development Indicators and OECD National Accounts
Exports of goods and services	World Bank, World Development Indicators and OECD National Accounts
Imports of goods and services	World Bank, World Development Indicators and OECD National Accounts
Household final cons. expend.	World Bank, World Development Indicators and OECD National Accounts
GDP deflator	World Bank, World Development Indicators and OECD National Accounts
Inflation, GDP deflator	World Bank, World Development Indicators and OECD National Accounts
Inflation, consumer prices	IMF, International Financial Statistics
Consumer price index	IMF, International Financial Statistics
Real effective exchange rate index	IMF, International Financial Statistics
GDP (current US$)	World Bank, World Development Indicators and OECD National Accounts
Current account (US Dollars)	IMF, International Financial Statistics
Total government expenditure	IMF, International Financial Statistics and IMF World Economic Outlook
Total government revenue	IMF, International Financial Statistics and IMF World Economic Outlook
World GDP (constant 2005 US$)	World Bank, World Development Indicators and OECD National Accounts
Terms of trade index (2005=100)	Estimates based on 46 commodities by Spatafora (2009)

Table A.2: Country Coverage

Sub-Saharan Africa	Resource-abundant	Botswana; Cameroon; Chad; Democratic Republic of the Congo; Republic of Congo; Cote d'Ivoire; Liberia; Mali; Mauritania; Niger; Nigeria; Sudan; Zambia;
	Non-resource-abundant	Benin; Burkina Faso; Burundi; Central African Republic; Ethiopia; Gambia; Ghana; Kenya; Lesotho; Madagascar; Malawi; Republic of Rwanda; Senegal; Sierra Leone; Somalia; Tanzania; Togo; Zimbabwe
Non Sub-Saharan Africa	HIC	Australia; Austria; Belgium; Canada; Republic of Chile; Denmark; Finland; France; Germany; Greece; Hong Kong; Ireland; Israel; Italy; Japan; Korea; Kuwait; Latvia; Netherlands; New Zealand; Norway; Oman; Poland; Portugal; Puerto Rico; Saudi Arabia; Singapore; Spain; Sweden; Switzerland; United Arab Emirates; United Kingdom; United States of America; Uruguay
	UMIC	Algeria; Argentina; Brazil; China; Colombia; Costa Rica; Cuba; Dominican Republic; Ecuador; Hungary; Iran; Iraq; Jamaica; Jordan; Libya; Malaysia; Mexico; Panama; Peru; South Africa; Thailand; Tunisia; Turkey; Venezuela
	LLMIC	Bangladesh; Bolivia; Egypt; El Salvador; Georgia; Guatemala; Haiti; Honduras; India; Indonesia; Morocco; Myanmar; Nepal; Nicaragua; Pakistan; Papua New Guinea; Paraguay; Philippines; Sri Lanka; Syria