Africa's Great Moderation: Online Appendix

The Appendix consists of 4 parts. Part A provides a spectral analysis to examine the qualities of the volatility of the growth rate of a GDP per capita as a proxy for adverse economic volatility. Part B examines GDP composition and volatility from the expenditure side. Part C provides additional tables and figures referred to in the main text of the paper. Part D is provided separately online,[18] and includes a few additional (detailed) tables and figures, and robustness checks for the machine learning analysis of structural factors in Section 5, using alternative outcome measures.

A. Spectral Analysis

As noted by Gelb (1979), many measures of instability used in economic literature are arbitrary and emphasize volatility at certain frequencies without rigorous justification. Shumway et al. (2000) show that first-differencing amounts to a high-pass filter that gives most weight to volatility at frequencies of 2 years and gradually down weights volatility at lower frequencies. Gelb (1979) suggests considering the full frequency spectrum and devising a weighting scheme emphasizing the relative importance of certain frequencies above others to generate an indicator. This Idea is formalized by Tsui (1988), who also shows that various common trend-cycle estimates (including first-differences) can be regarded as special cases of a weighting function $f(\omega)$ applied to the spectral density. This analysis follows Tsui (1988) and proposes a weighting function based on the empirical relationship of volatility at different frequencies with average growth rates.

In the first step, the spectral density of fluctuations needs to be computed for all country GDP per Capita series, shown in Figure C1 (the IMF series is used). Gelb (1979) notes that in the presence of strong trends, spectral density estimates on the raw series are often highly misleading because no periodic component fits the trend well, so variance from this very low-frequency phenomenon (the trend) "spills over" onto higher frequency components. Therefore all country series are first detrended using a linear trend on the log-level series, i.e. we consider all variation that lets countries depart from growing at a constant rate in per-capita terms. The spectral density can be approximated by the periodogram given by

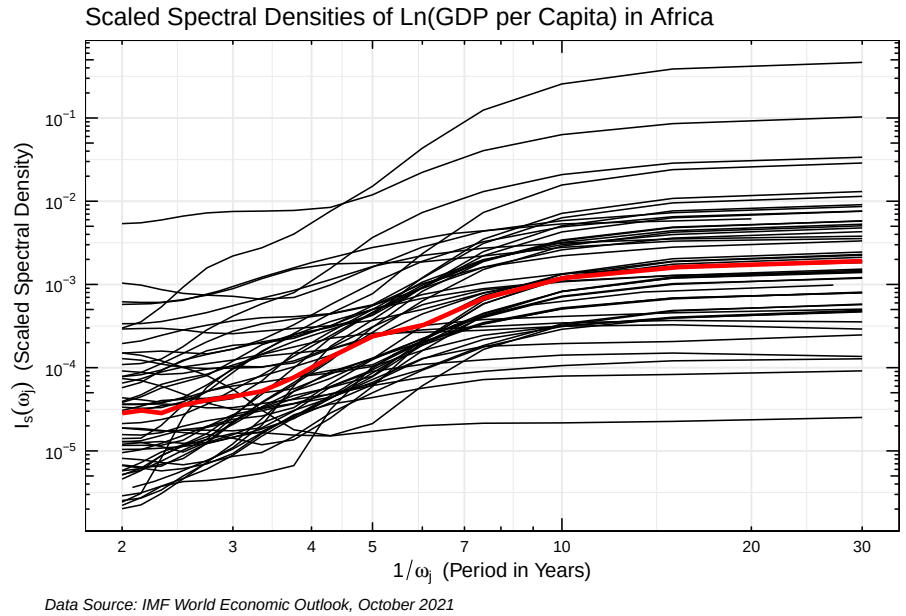
$$I(\omega_j) = |d(\omega_j)|^2 \qquad \text{where} \qquad d(\omega_j) = \frac{1}{\sqrt{n}} \sum_{t=1}^{n} x_t e^{-2\pi i \omega_j t} \tag{6}$$

is the complex-valued coefficient of the Discrete Fourier Transform at fundamental frequency $\omega_j = j/n$ for $j \in 0, \ldots, n-1$ of the series x_t observed for n periods. To aid interpretation we consider the scaled periodogram $I_s(\omega_j) = \frac{4}{n} I(\omega_j)$, such that the sum of the periodogram ordinates over all frequencies $\sum_{\omega_j} I_s(\omega_j)$ equals the squared amplitude of the signal x_t, and furthermore $\sum_{\omega_j} I_s(\omega_j) = 2\ var(x_t)$, such that the power of the scaled periodogram at each frequency ω can be considered as twice the contribution of that frequency to the overall variance of x_t.[19] A further issue is that the periodogram is not a consistent estimator of the spectral density. A frequently employed solution is smoothing the periodogram with Daniell smoothers to produce more consistent estimates. Another technique to improve the periodogram as a spectral estimator is tapering, which reduces the effect of frequencies outside the estimated interval. To reach consistent spectral estimates at the country level, I apply a cosine bell taper of 15% and smooth the periodogram with two modified Daniell smoothers of widths 3 and 7 (period-years), which are convolved to produce the final spectral estimates. The scaled densities thus estimated for all countries are shown in Figure A1, where the red line denotes the median across all country spectra.

[18] https://www.dropbox.com/s/57fact7ilsq0upc/Appendix%20D.pdf?dl=0

[19] It is a property of sine and cosine waves that the squared amplitude equals twice the variance. For details see Shumway et al. (2000).

Figure A1: Estimated Country Spectral Densities and Median Spectral Density



Data Source: IMF World Economic Outlook, October 2021

It is evident that the spectra of different countries are quite heterogeneous, with about 3 orders of magnitude lying between the least and most-volatile countries at each frequency, but an overall decrease in spectral power with higher frequencies is common to all countries. The median estimate in Figure A1 shows that on average volatility at low frequencies with periods of 20-years+ is around 2 orders of magnitude larger than year-to-year changes in output (2-year period).

To determine whether volatility at certain frequencies is harmful to growth in African economies, I compute the cross-sectional correlation of the spectral density with median GDP per capita growth in the 1990-2019 period, for each fundamental frequency ω_j. Figure A2 reports these correlations in the top half, and the bottom half shows corresponding regression coefficients, which also take into account the differing magnitudes of volatility at different frequencies that Figure A1 made evident.

Figure A2: Correlation of Spectral Density and Median Per-Capita Growth, Africa 1990-2019

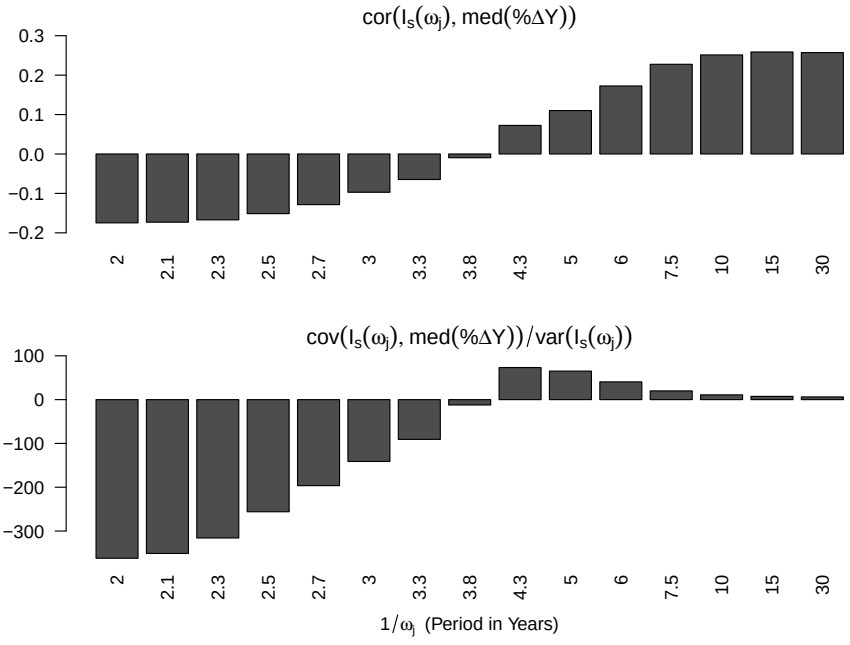


Figure A2 exhibits an astonishingly clear pattern, with a strong negative correlation of about -0.2 between economic growth and volatility at high frequencies of 0.5 (period 2 years), which then gradually tends to zero at frequencies of 0.25 (period 4 years), and turns positive up to about 0.3 for lower frequency variation with 10 to 30-year periods. Thus African data indeed show that short-term volatility with periods of up to 4 years is associated with lower growth, whereas volatility at longer periods is an indication of healthy growth.

This suggests that a high-pass filter like computing the growth rate might do reasonably well to extract fluctuations harmful to growth. I use the regression coefficients in the bottom half of Figure A2 to create an optimal discrete high-pass filter $f(\omega_j)$ in the spirit of Tsui (1988), that captures volatility harmful for growth. The filter simply consists of the absolute values of all negative regression coefficients on the frequency bands, setting positive coefficients to zero. Multiplying the spectral density estimate for each country with this filter and summing up the weighted spectral ordinates gives the power of the filtered spectrum, which provides a summary statistic of the harmful volatility in each country. Formally, I define a harmful volatility index (HVI) as

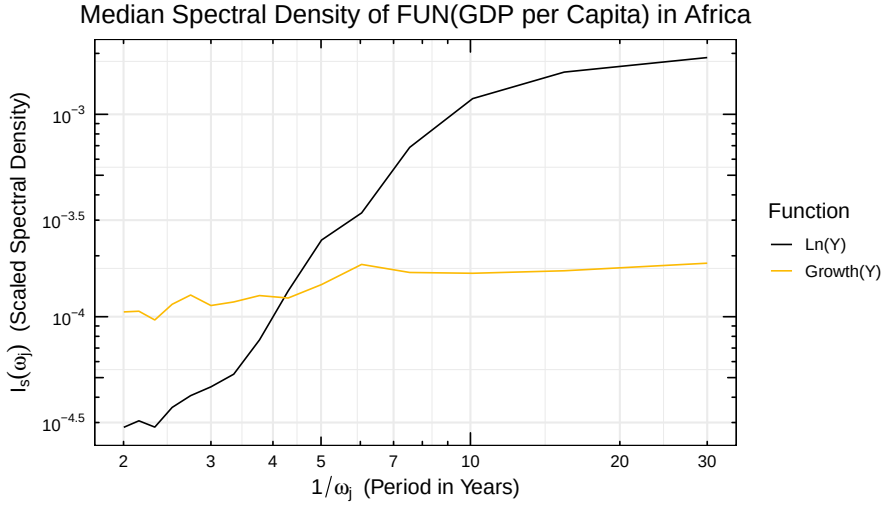
$$\text{HVI} = \sum_j f(\omega_j) \times I_s(\omega_j) \quad \text{where} \tag{7}$$

$$f(\omega_j) = -\beta_{\omega_j} \times 1[\beta_{\omega_j} < 0] \quad \text{and} \tag{8}$$

$$\beta_{\omega_j} = \frac{cov(I_s(\omega_j), med(\%\Delta Y))}{var(I_s(\omega_j))}. \tag{9}$$

Before comparing the HVI to some statistic computed on the growth rate, I wish to determine to what extent computing a growth rate itself resembles the transformation induced by applying $f(\omega_j)$ to the data. Figure A3 shows that computing the growth rate indeed works like a high-pass filter that, relative to the natural log baseline, accentuates volatility at periods lower than 4.2 years and dampens volatility at higher periods.

Figure A3: Spectral Densities of Growth Rate and Natural Log of GDP per Capita



Data Source: IMF World Economic Outlook, October 2021

Dividing the growth spectrum by the log spectrum yields the discrete filter that, if multiplied with the log spectrum, yields the same effect as computing a growth rate (i.e. differencing the log-level series) in the time domain. I call this derived first-difference filter $f^{\Delta}(\omega_j)$. To compare $f^{\Delta}(\omega_j)$ to the optimal empirical filter $f(\omega_j)$ based on regressions against median per capita growth, I scale both filters so that the weights/coefficients on all frequencies ω_j sum to 1. Figure A4 shows the outcome.

Figure A4: First-Difference Filter and Regression-Based Filter

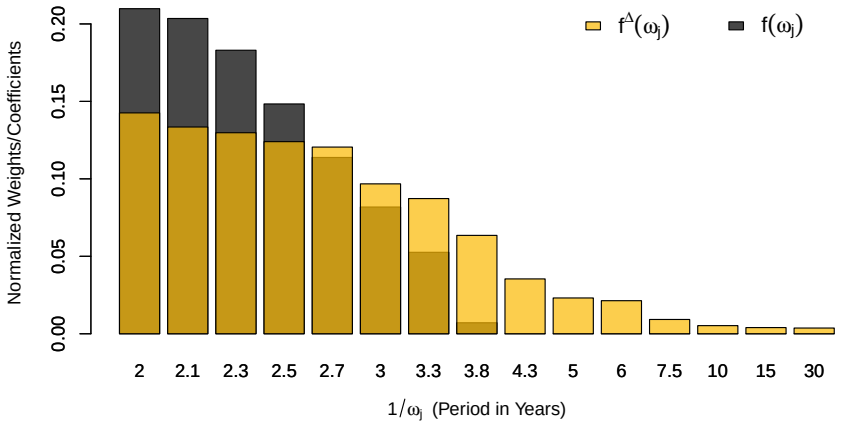
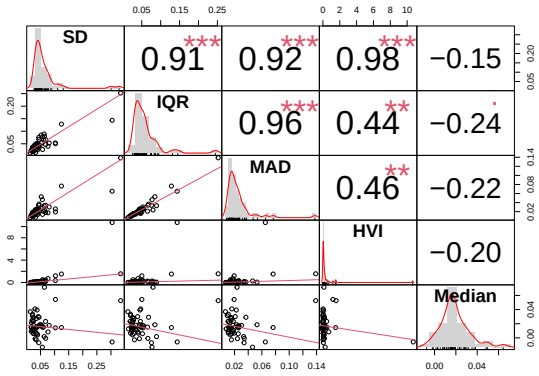


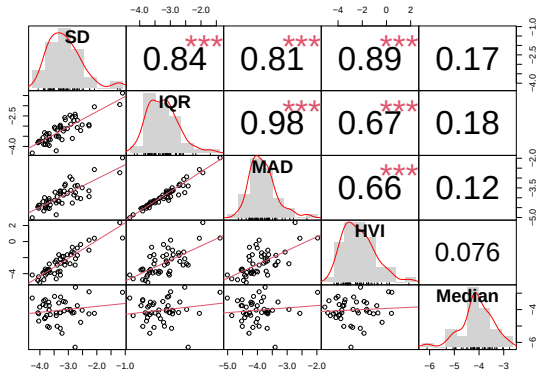
Figure A4 indicates that the first-difference filter $f^{\Delta}(\omega_j)$ broadly resembles the optimal empirical filter $f(\omega_j)$ for extracting volatility harmful to growth. Compared to the latter, first-differencing provides a smoother transformation of the data, that puts less weight on high-frequency volatility, but therefore keeps some of the low-frequency volatility as well. Since finding an optimal filter $f(\omega_j)$ to extract harmful economic volatility is likely always going to be a complex empirical task, and the resulting filter is prone to be highly dependent on the data and methodology used to estimate it, a simpler methodology such as computing first-differences and then applying some statistic to summarise the volatility in the differenced series is preferable to ensure the transparency and reproducibility of research. Below I consider the 3 summary statistics used in this paper: the standard deviation (SD), interquartile range (IQR), and median absolute deviation (MAD) of the growth rate of GDP per capita, and compare them to the HVI index (Eq. 7) and median per capita growth, computed for each African country using data from 1990 through 2019. The data are correlated, and a regression line is fit, using a robust MM estimator following Yohai (1987) and Koller & Stahel (2011), with a high breakdown point of 0.5, ensuring that outliers don't influence the estimates. Figure A5 shows charts including these robust fits, a robust correlation coefficient derived from the fit, and empirical volatility distributions estimated by a histogram and a gaussian kernel density.

Figure A5: Volatility Measures and Median GDP per Capita of 51 African Economies, 1990-2019

Raw Measures



Natural Log of Measures



The left side of Figure A5 shows that the HVI is positively correlated with all 3 volatility measures derived from the growth rate, particularly with the SD. All volatility measures are also negatively correlated with the median growth rate. Since a few countries such as Lybia, Guinea-Bissau, Eritrea, and Rwanda have very high levels of volatility (due to conflicts during this period), the empirical volatility distributions are right-skewed. As indicated on the left side, the negative correlation of the IQR and MAD of growth with median growth is stronger compared to the HVI

and the SD, which may be the effect of outliers having a stronger effect on the SD and HVI.[20] The right side of Figure A5 therefore also shows a version of the chart where the natural log was applied to all measures. This gives nicer scatterplots and density estimates but also lets the relationship between volatility and median growth turn positive (albeit insignificant), for all measures apart from the HVI where the correlation is zero. This change in the sign of correlations is explicable as some of the countries affected by conflict in 1990-2019, such as Rwanda and Guinea-Bissau, also experienced high average growth throughout this period, and may exert a stronger influence on the MM estimates after taking the log.

To conclude, the discussions in this section highlighted that when dealing with a difficult-to-measure phenomenon such as economic volatility, three things are important: precise measurement of (harmful) volatility, robustness against outliers, and a simple, reproducible, and data-independent methodology. This paper endorsed robust statistics such as the IQR and the MAD, computed on the growth rate of the series, to measure economic volatility. The analysis conducted in this section shows that computing the growth rate provides a decent approximation to an optimal empirical filter, applied to the spectral density to extract volatility harmful to economic development in Africa and that computing the IQR or MAD of the growth rate provides an acceptable and robust summary measure of this volatility, comparable to the power of the optimally filtered spectrum (the HVI). The IQR and MAD of the growth rate thus sufficiently meet the joint aims of precision, robustness, and simplicity. At the country level, the MAD is preferred to the IQR as it is more robust.

References

Gelb, A. (1979). On the definition and measurement of instability and the costs of buffering export fluctuations. *The Review of Economic Studies*, *46*(1), 149–162.

Koller, M., & Stahel, W. A. (2011). Sharpening wald-type inference in robust regression for small samples. *Computational Statistics & Data Analysis*, *55*(8), 2504–2515.

Shumway, R. H., Stoffer, D. S., & Stoffer, D. S. (2000). *Time series analysis and its applications* (Vol. 3). Springer.

Tsui, K. Y. (1988). The measurement of export instability: a methodological note. *Economics Letters*, *27*(1), 61–65.

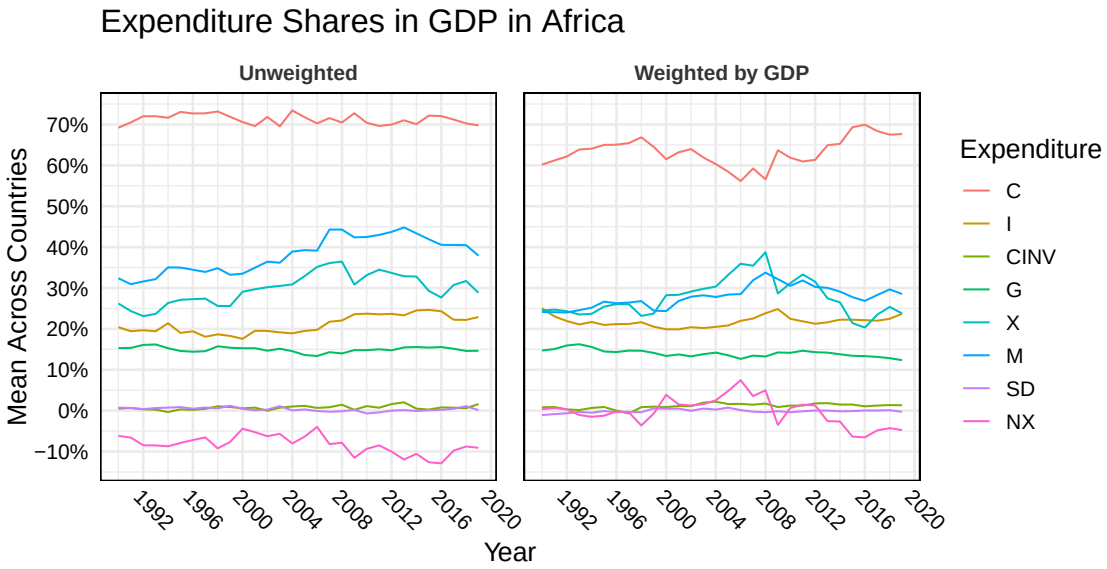
Yohai, V. J. (1987). High breakdown-point and high efficiency robust estimates for regression. *The Annals of statistics*, 642–656.

[20]The Fast Fourier Transform underlying the smooth spectral estimates used to produce the HVI is not robust against outliers.

B. A Brief Look at Expenditure on GDP

Figure B1 provides a detailed breakdown of expenditure shares in GDP, averaged across countries. CINV denotes changes in inventories, SD are statistical deviations, and exports (X) and imports (M) are provided alongside net exports (NX). CINV is very small in the median African country.

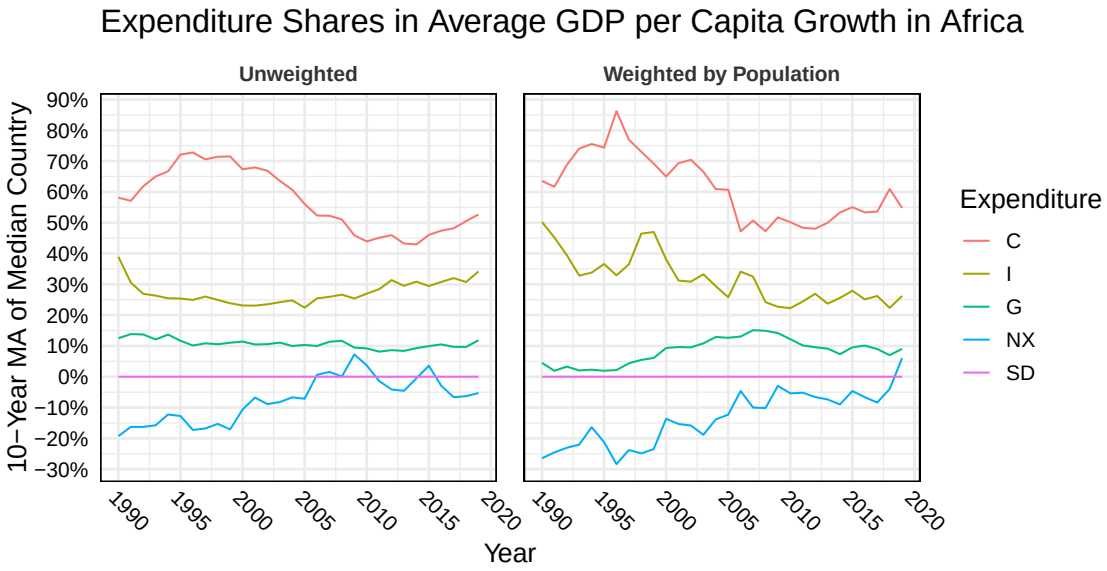
Figure B1: GDP Shares: Expenditure Side



Data Source: World Development Indicators, Accessed November 2021

Figure B2 shows smoothed contributions of major expenditure components to GDP per capita growth, analogous to Figure C11 on the production side. It is evident that consumption growth declined in importance until around 2013 and increased a bit again thereafter.

Figure B2: Contributions to GDP Growth: Expenditure Side



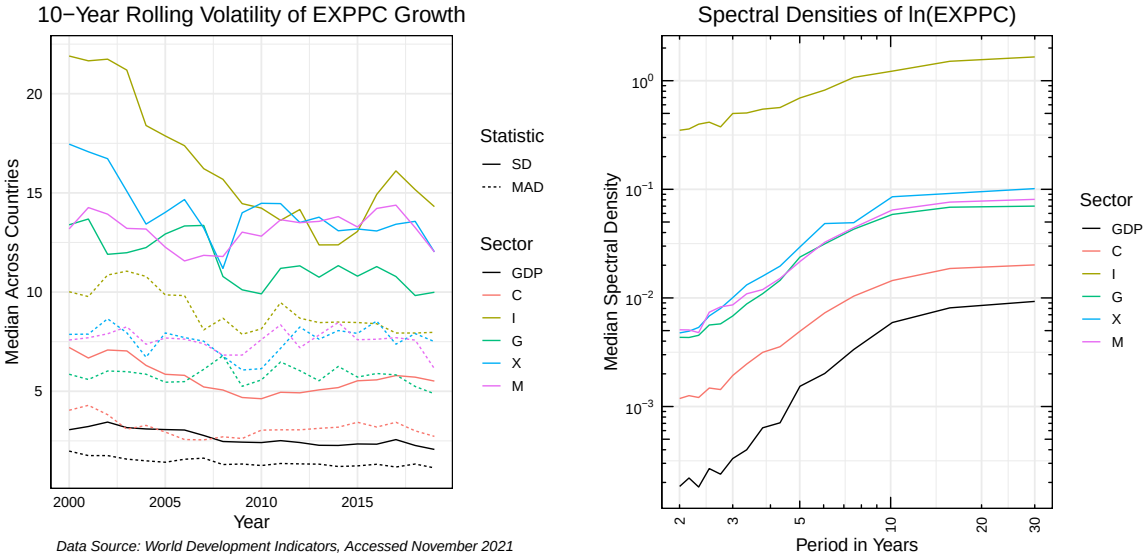
Data Source: World Development Indicators, Accessed November 2021

Overall the shares are relatively stable. Investment has increased slightly, climbing from $\sim 20\%$ in 2005 to $\sim 25\%$ in 2012. Exports and imports also both increased gradually until 2012 and then began to fall, with a greater decline in the export share, yielding a higher aggregate trade deficit.

The left panel of Figure B3 shows the aggregate decline in volatility, which, on the expenditure side, is accounted for by declines in the volatility of all components before 2010, with the volatility of

trade and investment remaining high thereafter. Particularly investment volatility (which includes CINV in this disaggregation), declined strongly. The right panel of Figure B3 shows that from a frequency domain perspective, investment is the most volatile component at all frequencies (exempting net exports). Consumption is the least volatile component and approaches the volatility of GDP at lower frequencies.

Figure B3: Expenditure Volatility Across Time and Frequency



Notes: The LHS shows 10-year rolling SDs and MADs of the growth rate of GDP per capita at constant 2015 prices and its expenditure components (GDP = C + I + G + X - M). For the RHS see the note to Figure 3 and Appendix A.

Table B1 provides a covariance matrix analogous to Table C6. This shows large negative covariances of imports with absorption and exports, indicating the endogeneity of net exports and the difficulties to account aggregate changes in volatility from the expenditure side. Linking production and expenditure side data is also difficult without detailed breakdowns, but the large declines in agriculture and service sector volatility are likely reflected on the expenditure side in the decline in consumption volatility, but also in declining volatility of the merchandise trade balance.

Table B1: Expenditure Volatility and Contribution to Aggregate Volatility, 1990-2019

Data	*Sector*:	C	I	G	X	M	C	I	G	X	M
GDP Share ($\bar{\theta}_k$)		0.701	0.227	0.152	0.336	-0.416	0.698	0.220	0.149	0.338	-0.406
	Cov.:	**Classical**					**Robust** (SDE)				
Expenditure	C	52.22					33.69				
Growth	I	-0.93	528.25				1.87	272.76			
(ΔVA/VA$_{t-1}$)	G	0.57	11.42	229.63			3.79	26.07	114.99		
	X	-7.82	14.84	-5.95	269.80		-14.96	5.14	-7.61	212.40	
	M	-26.78	-92.13	-16.58	-93.44	242.37	-20.57	-120.07	-29.83	-63.39	166.73
Expenditure	C	22.95					18.23				
Contribution	I	0.27	14.43				0.47	11.57			
(ΔVA/GDP$_{t-1}$)	G	0.12	0.56	3.41			-0.05	0.47	2.15		
	X	-1.09	0.79	-0.18	14.21		-2.02	0.56	-0.08	12.88	
	M	-5.36	-6.73	-0.91	-6.76	22.06	-5.08	-5.54	-1.51	-6.95	16.84

Notes: Since sectoral growth rates can be very volatile, I employ both a classical (Pearson) and robust covariance estimator with a high breakdown point (0.5) based on Stahel (1981) and Donoho (1982). The choice of methods was informed by Maronna et al. (2019) and available implementations in various R packages. The Stahel-Donoho robust covariance estimator is implemented by the package *rrcov* (Todorov & Filzmoser, 2009). Covariance terms are aggregated across countries using the median, whereas sectoral shares are aggregated with the mean. Average shares for each country are computed using all but the first observation following Eq. 3. The shares reported above "Robust" are computed by taking the median share for each country, and aggregating across countries using the mean.

Table B2 shows a decomposition of the reduction in GDP volatility between τ_1 = 1990-2004 and τ_2 = 2005-2019, based on the LHS of Eq. 3, analogous to Table B2 in the paper. Due to the difficulty with exports accounting, I only report results where shares are computed at the country-level and aggregated across countries using the median. The results imply that the expenditure-side shares in the moderation are roughly consistent with the their share in aggregate volatility, reported in Table B1, with consumption, investments and exports having a higher than

proportional share, consistent with Figure B3. The results are quite noisy through, even when aggregated across countries using the median; for example the sign of the covariance contribution from the expenditure side is not robust to the choice of covariance estimator.

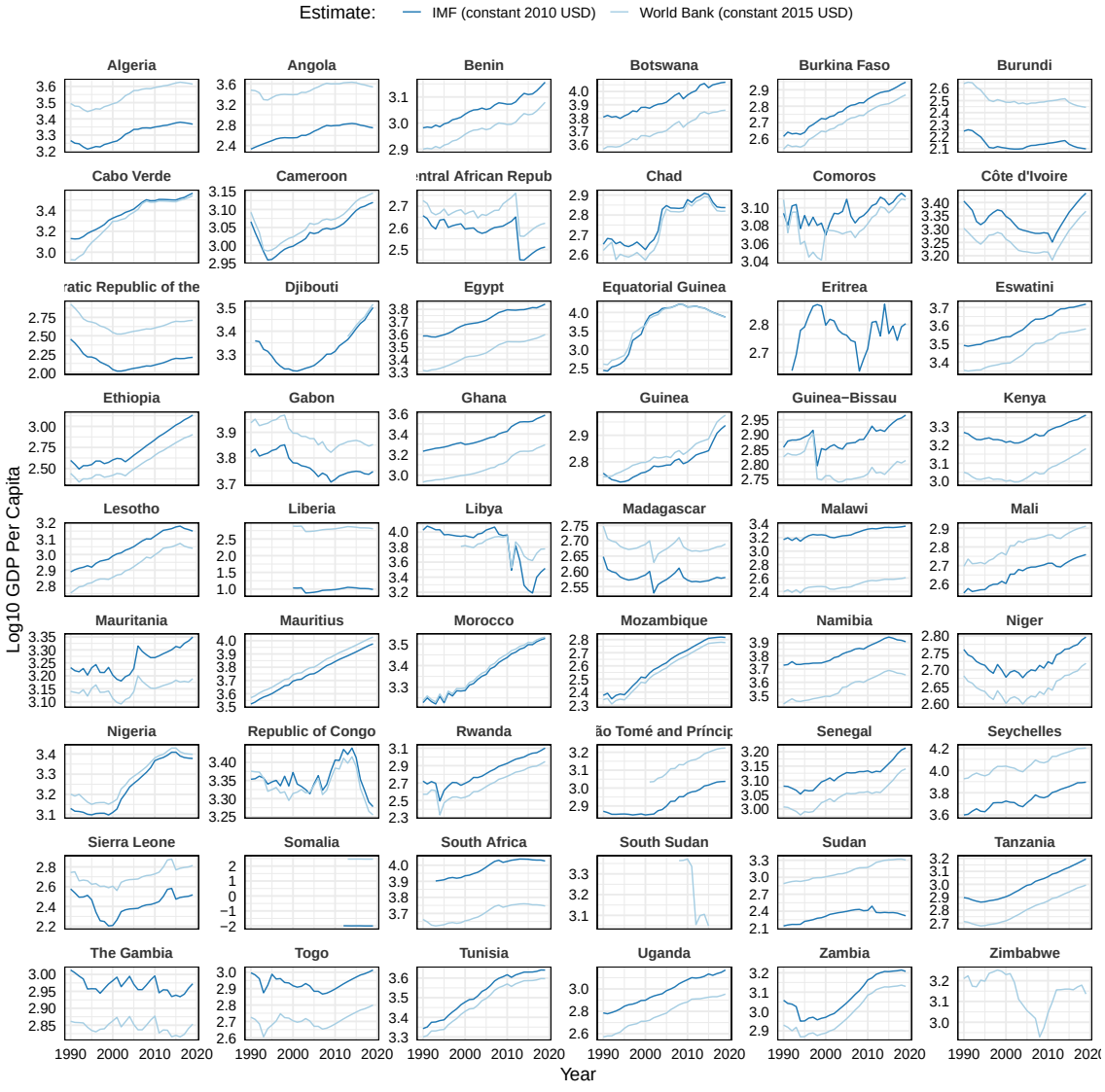
Table B2: Sectoral Contribution to Moderation in GDP Volatility

CovEst	AggFun	Fit	$\Delta var(\%\Delta Y)_\tau$	C	I	G	X	M	$\sum cov_{jk}$
Pearson	Median	100%	-6.65	48%	16%	3.8%	7.3%	11%	16%
Comedian	Median	55%	-1.14	73%	32%	5.1%	27%	12%	-35%

Notes: The 'Fit' column signifies how closely Eq. 3 is satisfied. Columns C-M give the sectoral contribution to the aggregate volatility reduction in percentage terms, and $\sum cov_{jk}$ gives the combined contribution of all covariance terms. Shares are computed at the country-level, and aggregated using the median.

C. Additional Tables and Figures

Figure C1: Log10 GDP per Capita for 54 African Economies in Constant USD, 1990-2019



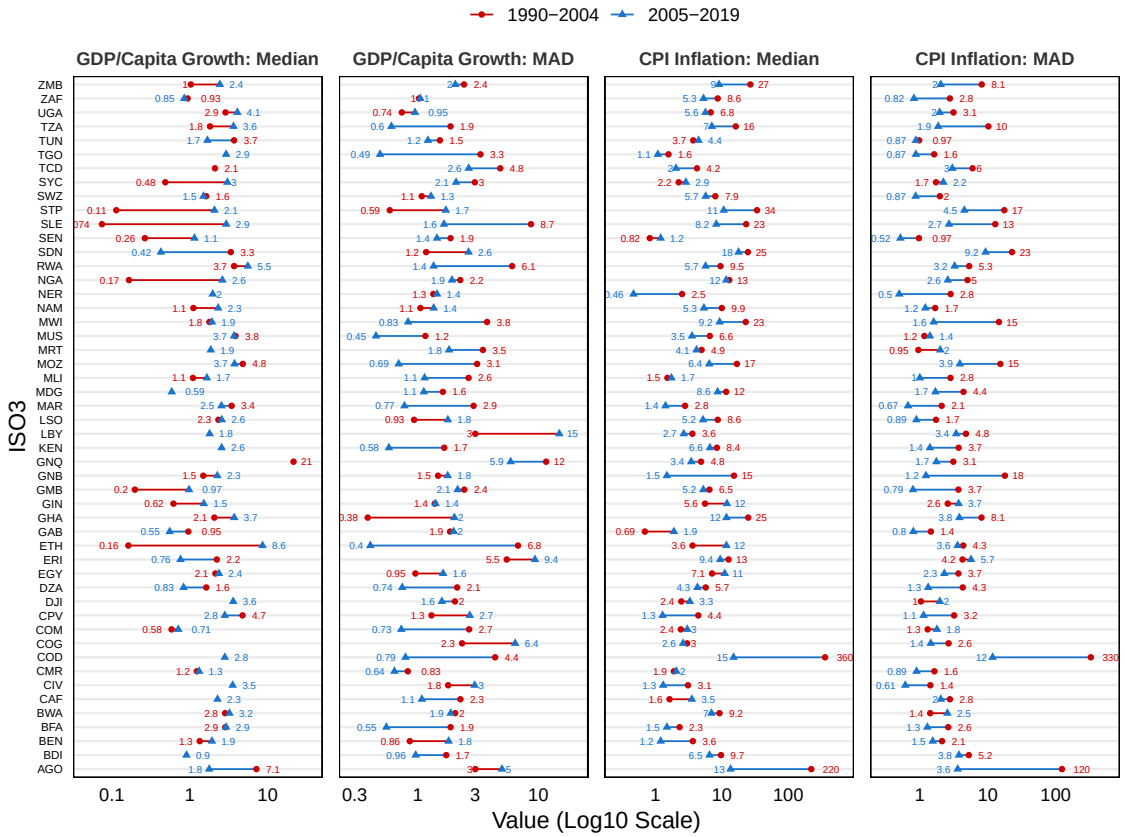
Data Source: IMF WEO October 2021 and IFS, and World Development Indicators November 2021

Table C1: Aggregate Volatility of 51 African Countries: 1990-2019

			GDP Per Capita Growth			CPI Inflation		
ISO3	Country	Income	Median	MAD	IQR	Median	MAD	IQR
DZA	Algeria	Upper middle	1.124	1.197	2.359	4.642	1.740	4.925
AGO	Angola	Lower middle	1.851	5.291	8.479	30.269	22.229	190.916
BEN	Benin	Low	1.422	1.246	2.320	2.140	1.766	3.978
BWA	Botswana	Upper middle	3.006	2.100	3.908	8.067	2.109	3.876
BFA	Burkina Faso	Low	2.883	1.476	2.601	1.804	2.025	3.812
BDI	Burundi	Low	-0.274	1.547	3.068	8.294	4.474	8.363
CPV	Cabo Verde	Lower middle	4.092	1.609	4.714	2.944	2.050	4.551
CMR	Cameroon	Lower middle	1.271	0.774	1.481	2.022	0.987	1.988
CAF	Central Afr. Rep.	Low	0.843	1.753	3.991	2.782	1.993	3.787
TCD	Chad	Low	-0.071	3.422	6.621	3.930	4.615	6.987
COM	Comoros	Lower middle	0.618	1.576	2.925	2.704	1.683	3.214
CIV	Côte d'Ivoire	Lower middle	-0.691	3.404	7.570	2.298	1.523	3.067
COD	Dem. Rep. o. Congo	Low	0.185	3.322	8.901	27.230	25.014	326.361
DJI	Djibouti	Lower middle	1.520	2.586	4.819	2.629	1.366	2.887
EGY	Egypt	Lower middle	2.133	1.258	2.389	9.727	3.186	5.367
GNQ	Equatorial Guinea	Upper middle	5.262	13.878	25.209	4.380	2.134	4.118
ERI	Eritrea	Low	1.457	7.647	12.841	10.288	5.501	10.631
SWZ	Eswatini	Lower middle	1.506	1.146	2.197	7.469	1.818	3.302
ETH	Ethiopia	Low	7.154	2.375	7.976	9.024	5.614	11.314
GAB	Gabon	Upper middle	0.664	1.940	4.110	1.448	1.220	2.249
GHA	Ghana	Lower middle	2.333	1.063	1.915	15.291	4.902	13.191
GIN	Guinea	Low	1.345	1.280	2.548	9.592	5.204	11.816
GNB	Guinea-Bissau	Low	1.493	1.402	2.710	3.277	3.886	13.204
KEN	Kenya	Lower middle	1.292	1.464	3.397	7.324	2.230	6.072
LSO	Lesotho	Lower middle	2.326	1.100	2.503	7.043	2.010	3.880
LBY	Libya	Upper middle	-0.577	6.512	14.369	3.122	3.704	7.868
MDG	Madagascar	Low	0.433	1.383	2.551	9.100	2.824	5.332
MWI	Malawi	Low	1.863	2.294	4.394	10.460	2.828	15.386
MLI	Mali	Low	1.493	1.412	3.018	1.563	2.617	5.526
MRT	Mauritania	Lower middle	1.682	2.670	5.467	4.715	1.547	2.772
MUS	Mauritius	Upper middle	3.702	0.666	1.326	5.164	1.936	3.644
MAR	Morocco	Lower middle	2.743	1.542	2.917	1.576	0.939	2.312
MOZ	Mozambique	Low	3.935	2.257	4.526	12.531	8.445	13.257
NAM	Namibia	Upper middle	1.782	1.756	3.442	6.727	2.590	4.673
NER	Niger	Low	-0.120	2.424	4.382	0.952	1.821	2.887
NGA	Nigeria	Lower middle	1.521	2.463	4.909	11.837	3.253	5.849
COG	Republic of Congo	Lower middle	-1.317	4.648	7.723	2.790	1.860	3.586
RWA	Rwanda	Low	5.427	1.942	5.033	6.374	3.907	7.907
SEN	Senegal	Lower middle	1.053	1.842	3.601	1.082	0.894	1.857
SYC	Seychelles	High	2.909	3.665	6.798	2.630	1.846	3.433
SLE	Sierra Leone	Low	1.415	2.604	5.344	13.312	7.259	16.186
ZAF	South Africa	Upper middle	0.911	1.079	2.289	5.980	1.368	3.713
SDN	Sudan	Lower middle	2.325	1.822	4.635	20.161	13.356	38.351
STP	São Tomé & Príncipe	Lower middle	0.658	1.103	2.032	13.830	6.478	23.908
TZA	Tanzania	Low	3.143	0.939	2.023	7.561	3.312	10.897
GMB	The Gambia	Low	0.585	2.546	5.186	5.306	1.743	2.736
TGO	Togo	Low	1.532	2.112	6.524	1.348	1.226	3.446
TUN	Tunisia	Lower middle	2.490	1.505	2.825	4.092	1.104	2.029
UGA	Uganda	Low	3.340	1.094	2.025	5.970	2.446	7.148
ZMB	Zambia	Lower middle	1.696	2.585	4.367	18.147	9.063	17.567
ZWE	Zimbabwe	Lower middle	-0.840	4.289	10.358	0.641	5.470	12.797

Notes: Excluding Liberia, Somalia, and South Sudan. Data Source: IMF WEO October 2021.

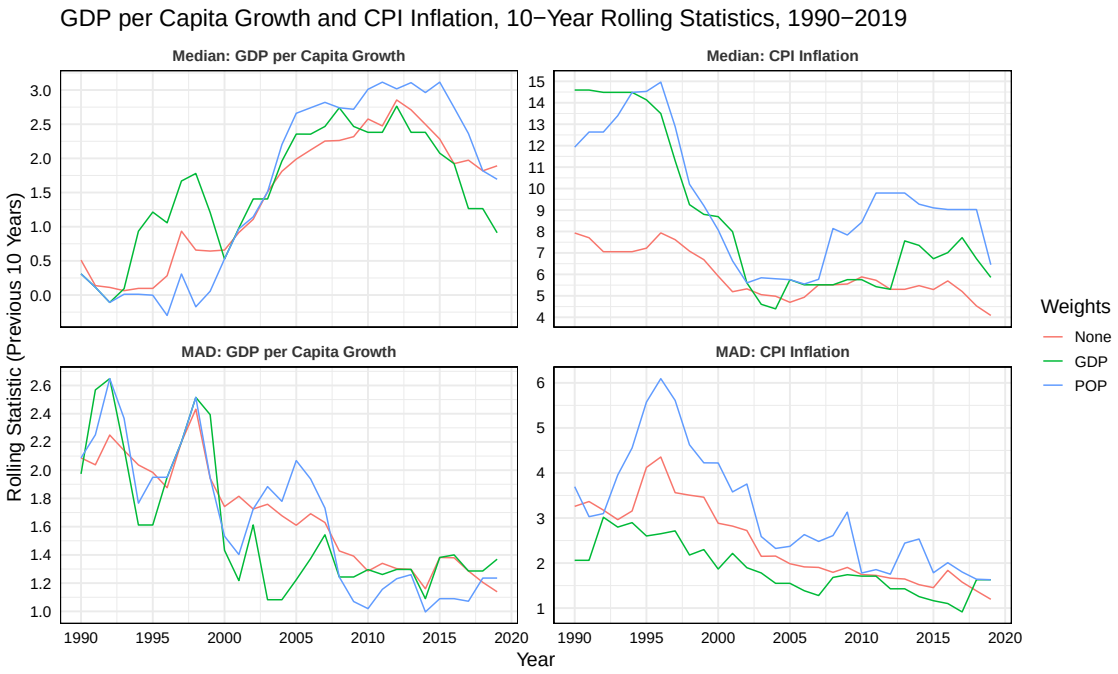
Figure C2: The Great Moderation by Country: 50 African Countries



Data Source: IMF World Economic Outlook, October 2021

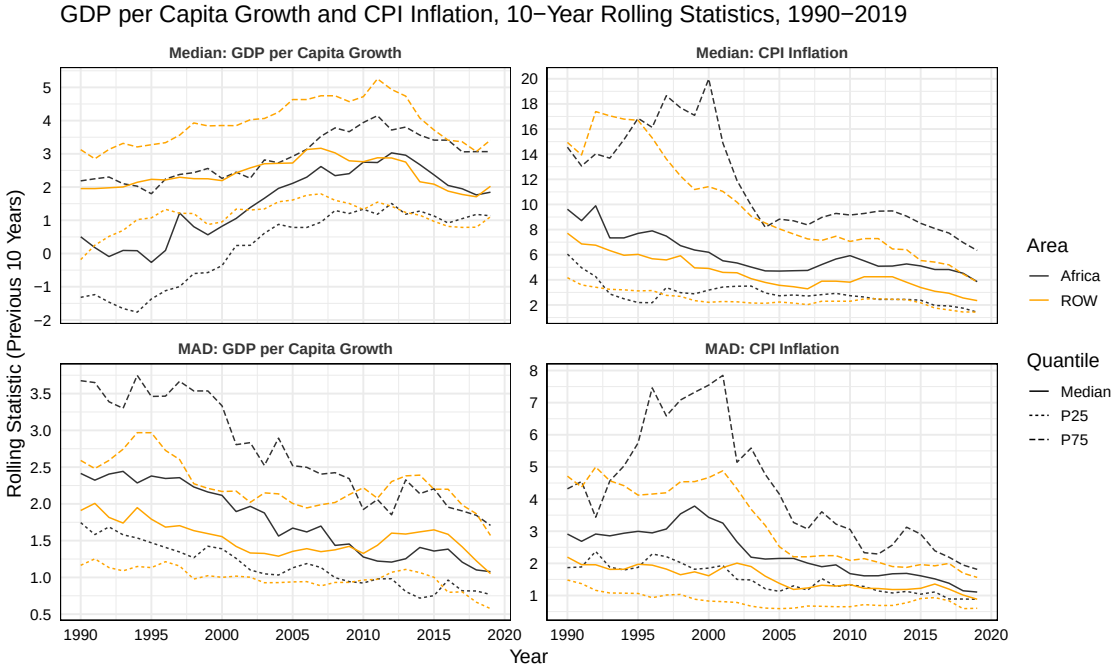
Section 2: Aggregate Relationships and Trends

Figure C3: Volatility in Africa Over Time



Data Source: IMF World Economic Outlook, October 2021

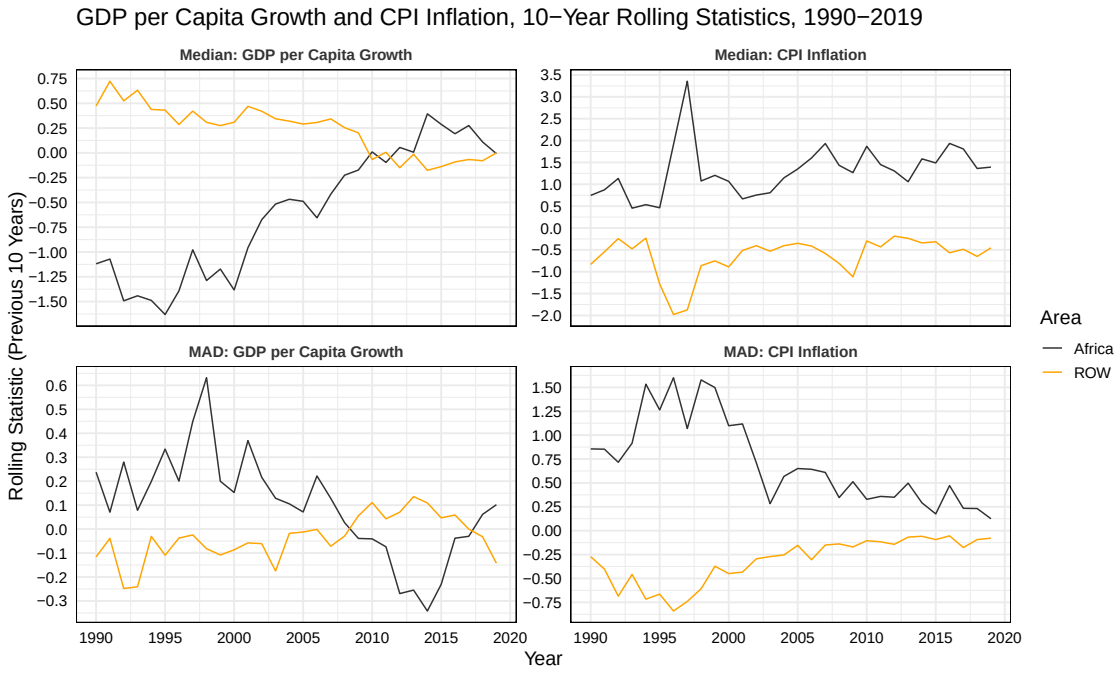
Figure C4: Figure 1 with World Bank WDI Data



Data Source: World Development Indicators, Accessed November 2021

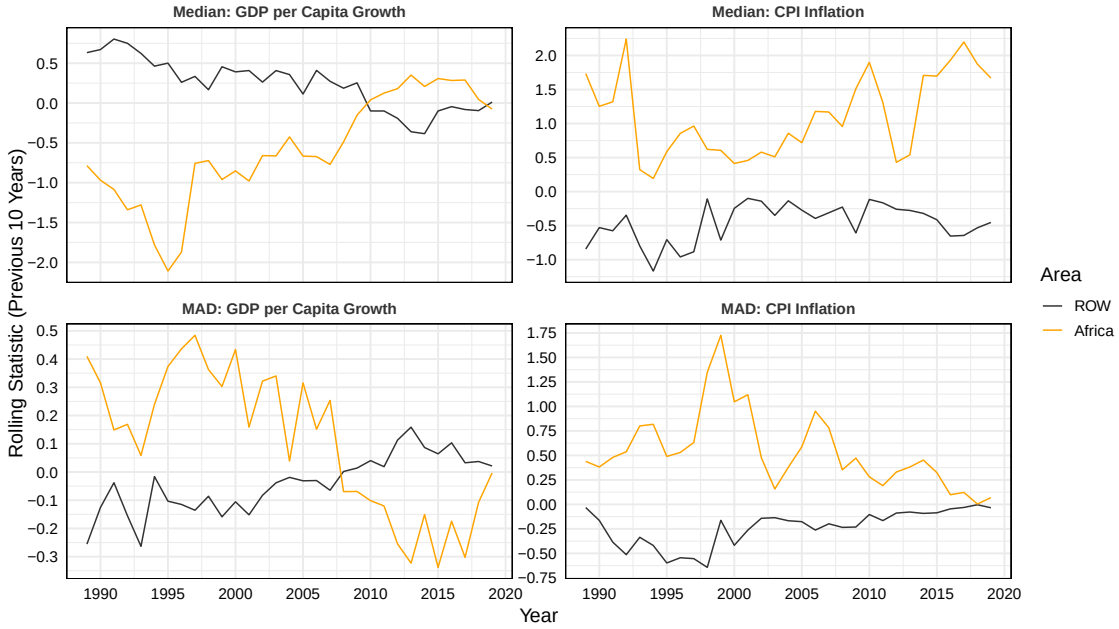
Figure C5: Figure 1 with Time-Medians Subtracted from Rolling Statistics

IMF WEO Data



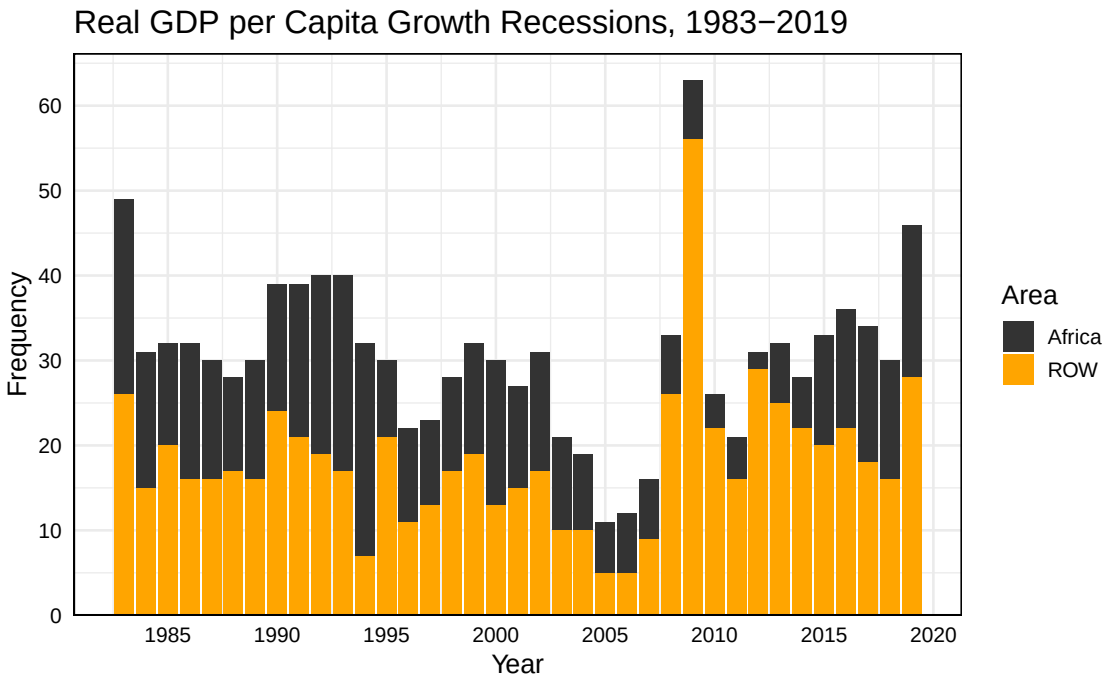
Data Source: IMF World Economic Outlook, October 2021

World Bank WDI Data



Source: World Development Indicators, 2021

Figure C6: Growth Recessions Following Syed et al. (2017)



Data Source: IMF World Economic Outlook, October 2021

Figure C7: AR1 Analysis à la Blanchard & Simon (2001) with World Bank Data

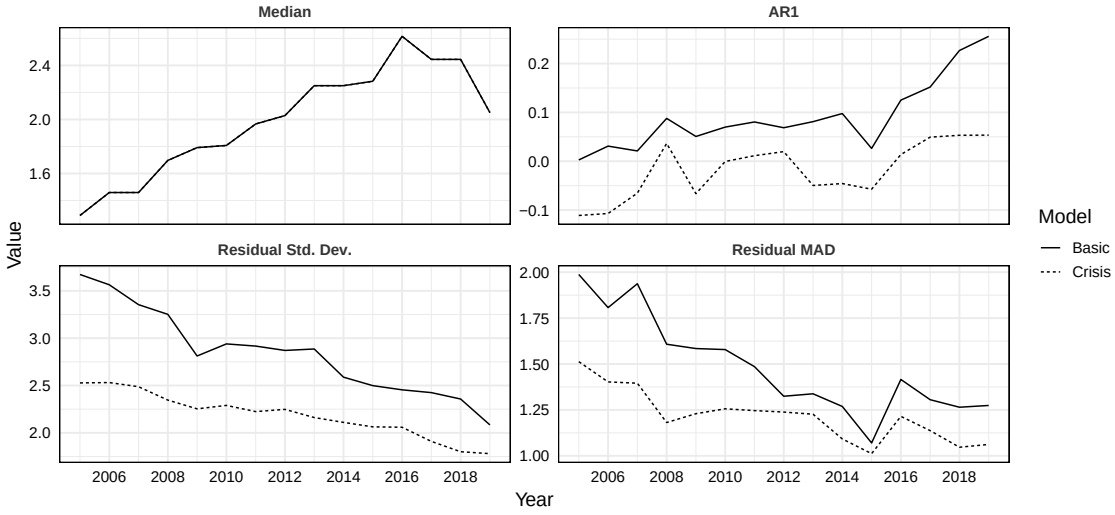


Table C2: Real Per Capita Growth and Inflation Performance in Africa, 1990-2019

Area		Per Capita Growth			Inflation		
	N	Median	MAD	IQR	Median	MAD	IQR
Africa	**51**	**1.506**	**1.822**	**3.991**	**5.306**	**2.230**	**4.925**
Low income	21	1.457	1.942	4.382	6.374	3.312	7.907
Lower middle income	21	1.521	1.609	3.601	4.715	2.010	3.880
Upper middle income	8	1.453	1.848	3.675	4.903	2.023	3.997
High income (SYC)	1	2.909	3.665	6.798	2.630	1.846	3.433
ROW	**124**	**2.370**	**1.724**	**3.532**	**3.549**	**1.754**	**4.318**
Low income	5	2.755	1.172	2.642	12.007	4.102	10.610
Lower middle income	24	2.985	1.654	3.085	6.996	2.733	5.856
Upper middle income	43	2.752	2.173	4.207	5.015	2.581	6.057
High income	52	1.758	1.616	3.178	2.285	1.024	2.112

Data Source: IMF WEO, October 2021. Real GDP per capita growth is calculated using the constant national currency series (NGDPRPC), and inflation is based on average national consumer price indices (PCPIPCH).
Notes: Statistics are calculated at the country-level, and aggregated across countries using the median. Countries with < 20 obs. for growth or inflation in 1990-2019 were excluded - in Africa Liberia, Somalia and South Sudan.

Figure C8: Empirical Relationship Between Levels and Volatilities

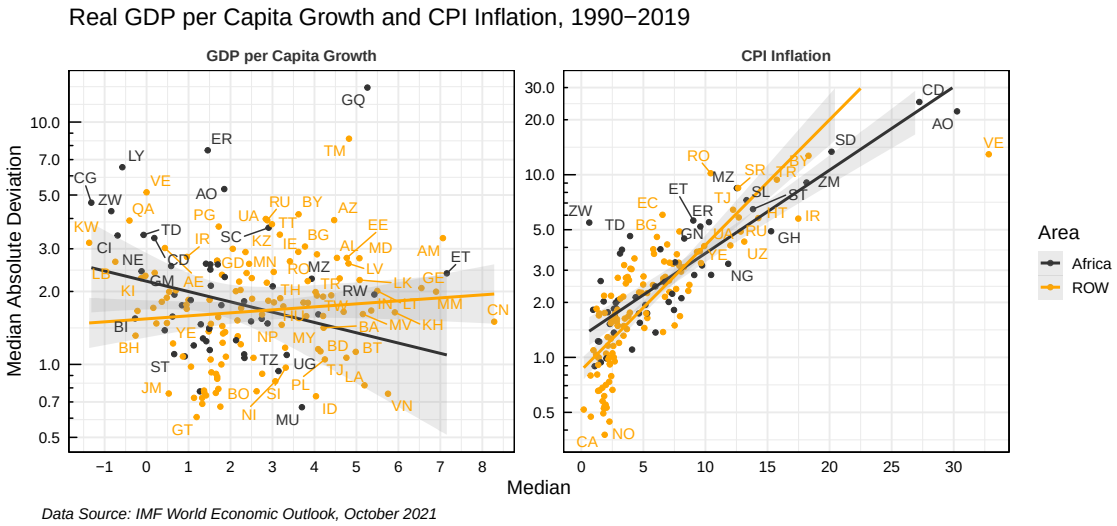


Table C3: Output and Inflation Volatility

Area		GDP/Capita			Inflation		
	N	β	P($\beta \neq 0$)	R^2	β	P($\beta \neq 0$)	R^2
Africa	**51**	**-0.187**	**0.035**	**0.083**	**0.375**	**<0.001**	**0.596**
Low income	21	-0.048	0.596	0.016	0.396	<0.001	0.608
Lower middle income	21	-0.569	0.002	0.389	0.252	<0.001	0.810
Upper middle income	8	-0.837	0.130	0.370	0.058	0.689	0.026
ROW	**124**	**0.043**	**0.322**	**0.008**	**0.361**	**<0.001**	**0.820**
Low income	5	-0.076	0.228	0.444	0.365	0.246	0.427
Lower middle income	24	-0.105	0.341	0.041	0.252	<0.001	0.632
Upper middle income	43	0.068	0.343	0.022	0.383	<0.001	0.800
High income	52	0.125	0.055	0.066	0.427	<0.001	0.478

Data Source: IMF WEO, October 2021. See also footnote to Table C2.
Note: A regression of the medians on the MADs of the country-series is run using a robust MM estimator following Koller & Stahel (2011). Available in R package *robustbase* (Maechler et al., 2021).

Figure C9: Empirical Relationship Between Levels and Volatilities in Africa

Whole Period: 1990-2019 *Half-Period Difference:* 2005-19 − 1990-04

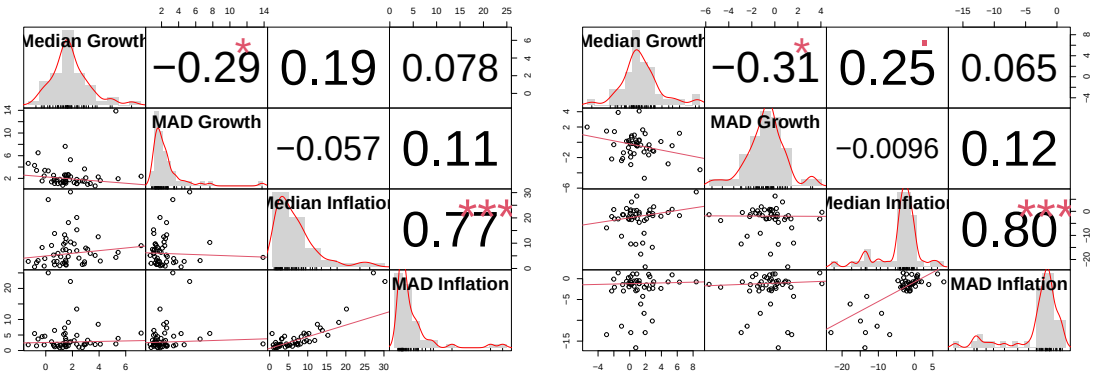


Table C4: Variation (MAD) Between Countries Over Time by Income Group

			Per Capita Growth			Inflation		
Area	Period	N	Median	MAD	IQR	Median	MAD	IQR
Africa	**1990-04**	**50**	**1.166**	**0.834**	**2.122**	**3.868**	**1.568**	**3.272**
	2005-19	**50**	**0.806**	**0.586**	**0.986**	**3.175**	**0.876**	**1.590**
Low income	1990-04	21	1.119	1.049	2.069	4.783	1.612	3.024
	2005-19	21	0.742	0.427	0.549	3.639	1.051	2.983
Lower middle income	1990-04	20	1.342	0.670	1.605	3.405	1.340	2.359
	2005-19	20	0.564	0.492	1.138	3.457	0.733	1.313
Upper middle income	1990-04	8	0.948	0.845	1.402	2.522	0.843	0.950
	2005-19	8	0.878	0.719	1.997	1.307	0.465	0.669
ROW	**1990-04**	**118**	**1.141**	**0.585**	**1.233**	**3.245**	**1.245**	**2.792**
	2005-19	**119**	**1.144**	**0.683**	**1.235**	**1.375**	**0.511**	**1.074**
Low income	1990-04	4	0.691	0.675	1.137	5.708	2.747	16.987
	2005-19	4	1.941	0.551	0.849	1.244	1.212	2.249
Lower middle income	1990-04	23	1.247	0.401	1.043	2.105	2.237	4.146
	2005-19	23	1.921	0.426	1.203	1.421	0.581	1.188
Upper middle income	1990-04	39	1.382	0.783	1.708	5.367	2.796	10.957
	2005-19	40	1.535	0.618	0.986	1.642	0.580	1.269
High income	1990-04	52	0.866	0.402	0.928	0.869	0.386	0.735
	2005-19	52	0.914	0.613	1.344	0.530	0.329	0.617

Data Source: IMF WEO, October 2021. Real GDP per capita growth is calculated using the constant national currency series (NGDPRPC), and inflation is based on average national consumer price indices (PCPIPCH).
Notes: Statistics calculated at country-level and aggregated across countries using the MAD. Countries with < 9 obs. for growth or inflation in 1990-04 or 2005-19 were excluded, in Africa Liberia, Somalia, South Sudan, and Zimbabwe.

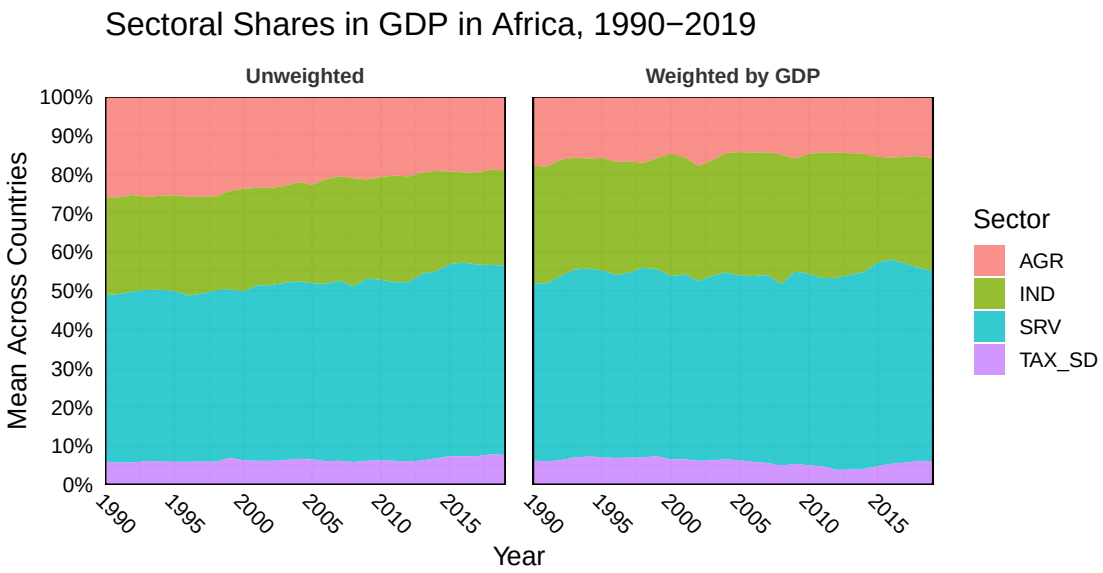
Table C5: International Synchronization of Growth/Inflation Rates: World Bank Data

	Per Capita Growth				Inflation			
Period	Africa	ROW	World	Corr	Africa	ROW	World	Corr
1990-2004	0.199	0.221	0.202	0.245	0.386	0.404	0.364	0.327
2005-2019	0.252	0.388	0.321	0.275	0.415	0.516	0.476	0.400
Overall (1990-2019)	0.162	0.234	0.191	0.189	0.374	0.395	0.356	0.298

Data Source: IMF WEO, October 2021. See also note to Table 1.
Notes: The numbers under 'Africa', 'ROW' and 'World' are the share of the first eigenvalue in the sum of eigenvalues, computed from a pairwise Pearson's correlation matrix of the country-series. They estimate the share of an international business cycle in the joint variance of the data. The 'Corr' column reports the average absolute correlation between African and ROW countries series and measures alignment between Africa and ROW.

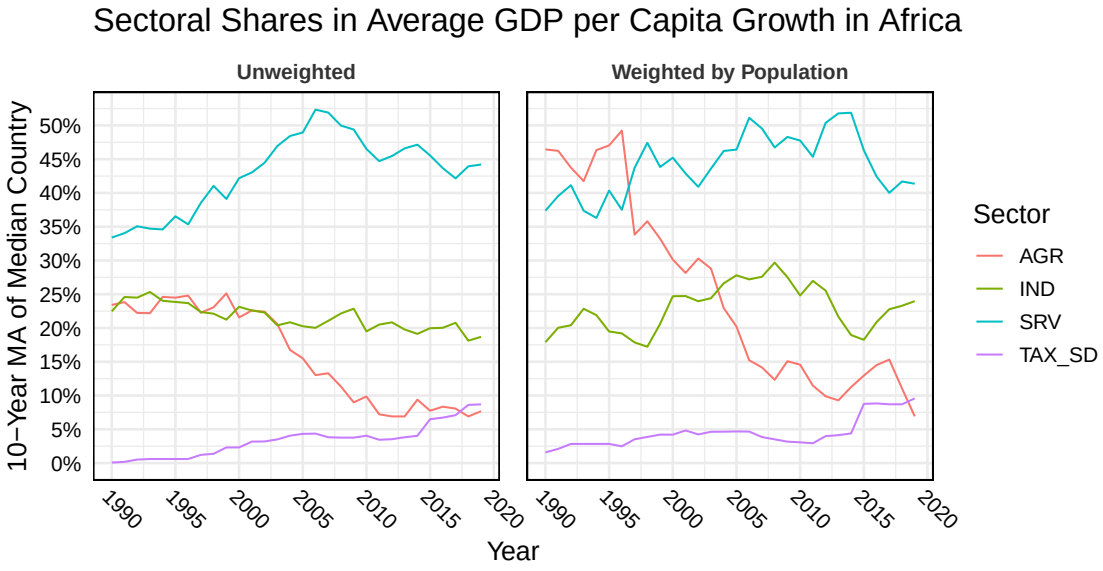
Section 3: Decomposing Output Volatility

Figure C10: Production side GDP Shares



Data Source: World Development Indicators, Accessed November 2021

Figure C11: Production side GDP Growth Shares



Data Source: World Development Indicators, Accessed November 2021

Table C6: Sectoral Volatility and Contribution to Aggregate Volatility, 1990-2019

Data	*Sector*:	AGR	IND	SRV	AGR	IND	SRV
Sector Share ($\bar{\theta}_k$):		0.232	0.276	0.492	0.226	0.276	0.494
	Covariance:	**Classical**			**Robust** (SDE)		
Sector Growth ($\Delta VA/VA_{t-1}$)	AGR	126.95			69.01		
	IND	-12.77	124.60		-5.67	64.73	
	SRV	-2.64	-9.86	52.93	-1.34	-1.78	25.90
Sector Contribution ($\Delta VA/GDP_{t-1}$)	AGR	6.40			2.14		
	IND	-0.50	5.79		-0.30	2.85	
	SRV	-0.21	-0.66	8.44	-0.06	-0.38	5.39

Notes: Since sectoral growth rates can be very volatile, I employ both a classical (Pearson) and robust covariance estimator with a high breakdown point (0.5) based on Stahel (1981) and Donoho (1982). The choice of methods was informed by Maronna et al. (2019) and available implementations in various R packages. The Stahel-Donoho robust covariance estimator is implemented by the package *rrcov* (Todorov & Filzmoser, 2009). Covariance terms are aggregated across countries using the median, whereas sectoral shares are aggregated with the mean. Average shares for each country are computed using all but the first observation following Eq. 3. The shares reported above "Robust" are computed by taking the median share for each country, and aggregating across countries using the mean.

Figure C12: Rolling Covariances of Sectoral Growth Rates/Contribution

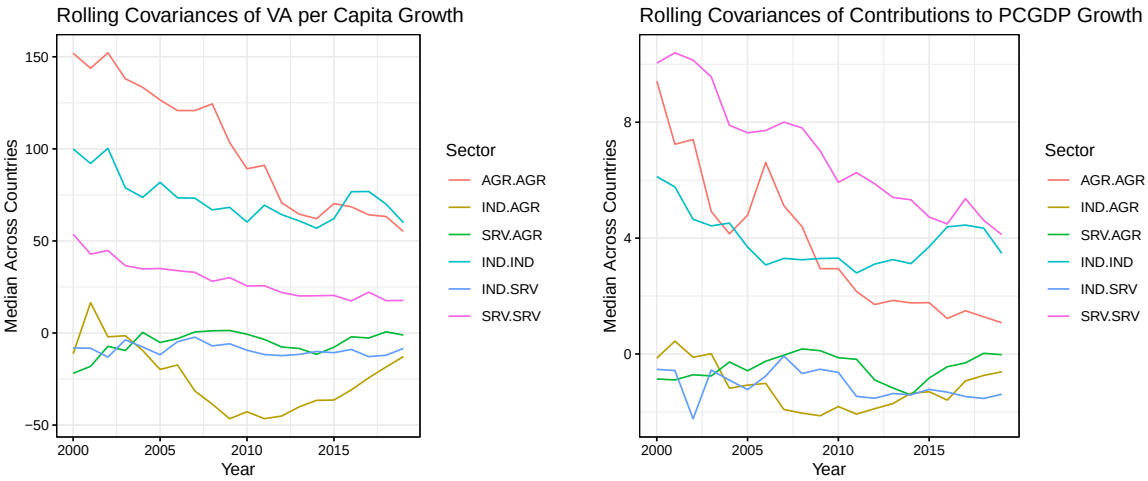


Figure C13: Production side GDP Shares: ETD Data

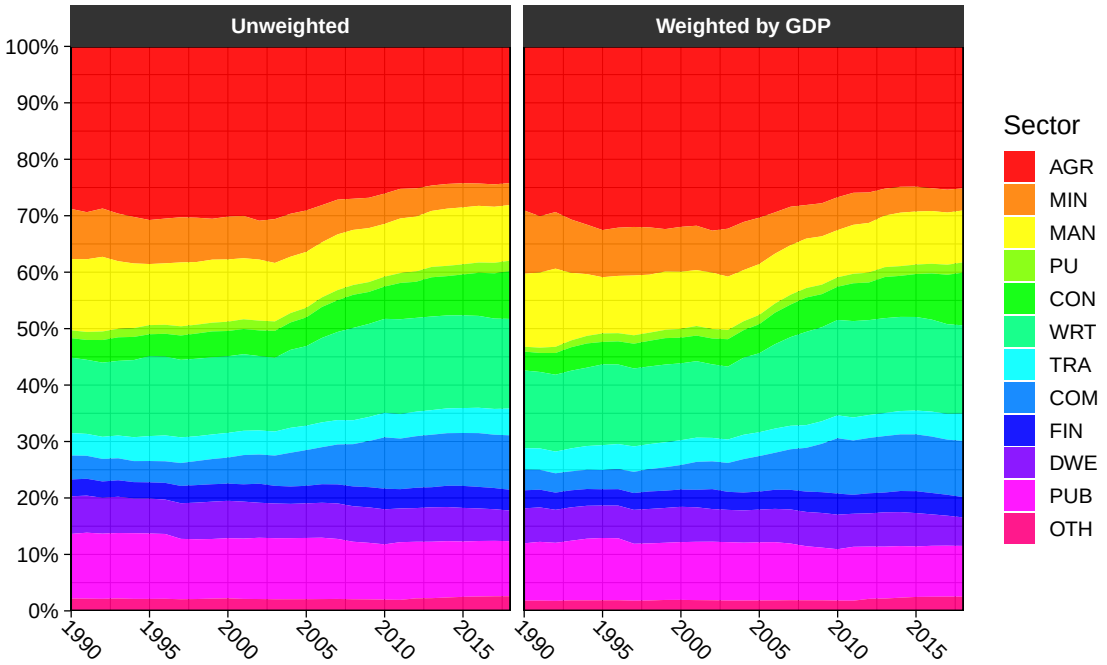


Figure C14: Sector Volatility and Contribution to Aggregate Volatility

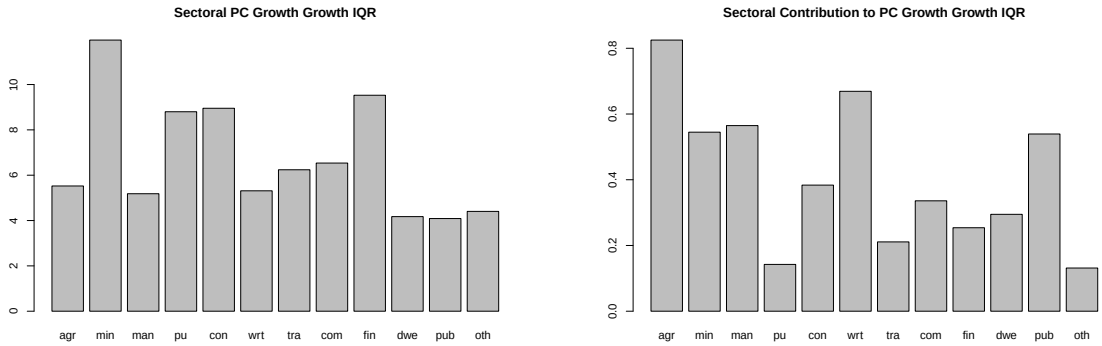


Figure C15: Rolling MADs of Sectoral Growth Rates/Contribution

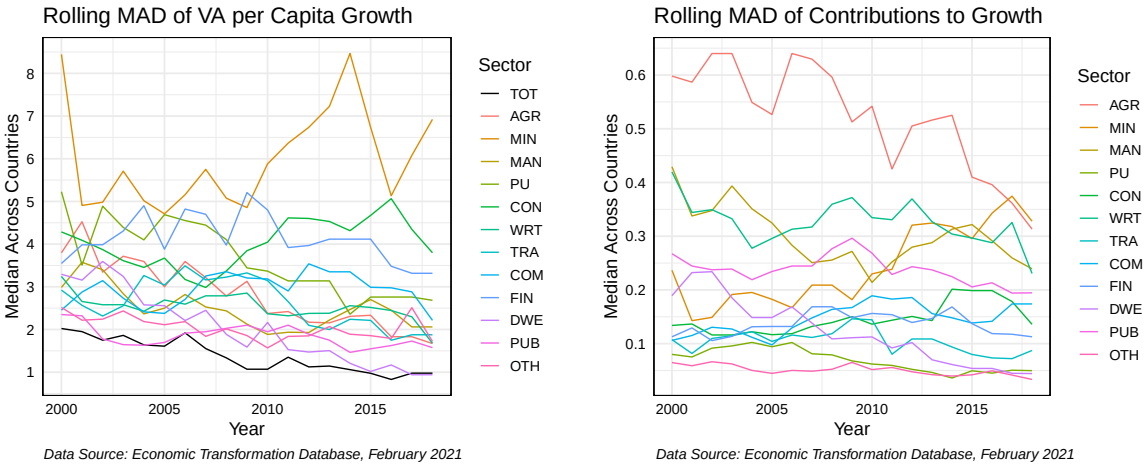


Table C7: Country Classification by Largest Sectoral Volatility

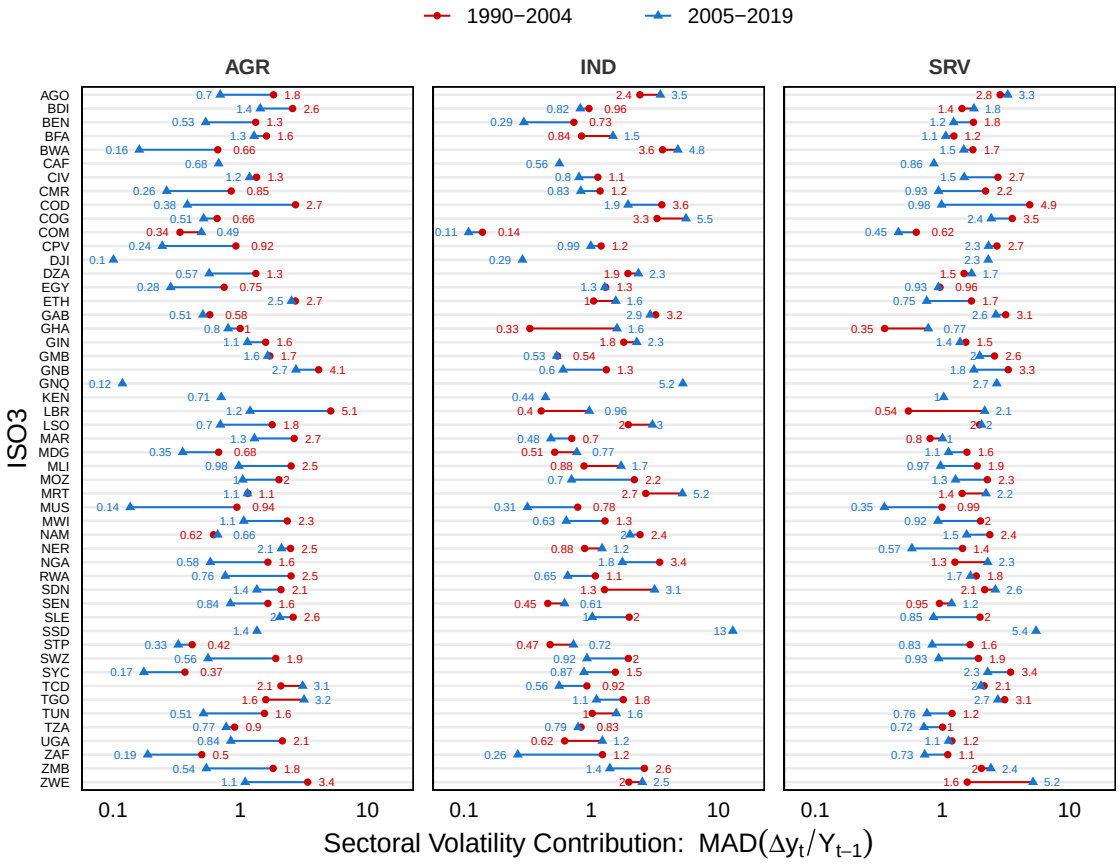
Metric	**AGR** (13)	**IND** (17)	**SRV** (21)
Sectoral Volatility Contribution: MAD($\Delta y_t/Y_{t-1}$)	BDI, BFA, ETH, GNB, LBR, MAR, MLI, NER, SEN, SLE, TCD, UGA, ZWE	AGO, BWA, COD, COG, DZA, EGY, GAB, GIN, GNQ, LSO, MRT, MUS, NGA, SSD, SWZ, TUN, TZA	BEN, CAF, CIV, CMR, COM, CPV, DJI, GHA, GMB, KEN, MDG, MOZ, MWI, NAM, RWA, SDN, STP, SYC, TGO, ZAF, ZMB
Metric	**AGR** (22)	**IND** (28)	**SRV** (1)
Sector Growth Volatility: MAD($\%\Delta y_t$)	AGO, BFA, CAF, CMR, COM, CPV, DJI, DZA, GHA, GIN, GMB, GNB, KEN, MAR, MUS, SEN, SWZ, SYC, TUN, ZAF, ZMB, ZWE	BDI, BEN, BWA, CIV, COD, COG, EGY, ETH, GNQ, LBR, LSO, MDG, MLI, MOZ, MRT, MWI, NAM, NER, NGA, RWA, SDN, SLE, SSD, STP, TCD, TGO, TZA, UGA	GAB

Table C8: Aggregate Sectoral Growth Stabilization

Period:	1990-2019			1990-2004			2005-2019		
Sector:	AGR	IND	SRV	AGR	IND	SRV	AGR	IND	SRV
Statistic: Median Across Countries (and Periods)									
MAD($\Delta y_t/Y_{t-1}$)	1.06	1.17	1.57	1.63	1.21	1.74	0.71	1.02	1.38
MAD($\%\Delta y_t$)	5.69	5.46	3.14	6.56	5.74	3.95	5.05	4.75	2.65
Share of Countries Above the 1990-2019 Cross-Country-Period Median									
MAD($\Delta y_t/Y_{t-1}$)	0.57	0.49	0.51	0.61	0.47	0.51	0.33	0.47	0.43
MAD($\%\Delta y_t$)	0.47	0.47	0.61	0.49	0.51	0.57	0.45	0.43	0.37

Note: The 1990-2019 statistics are medians across country-level MADs for both the 1990-2004 and 2005-2019 periods. This more accurately reflects the median volatility between these two periods, since country-level MADs calculated over the entire 1990-2019 period are much closer to the 2005-2019 MADs.

Figure C16: Sectoral Volatility Contribution by Country

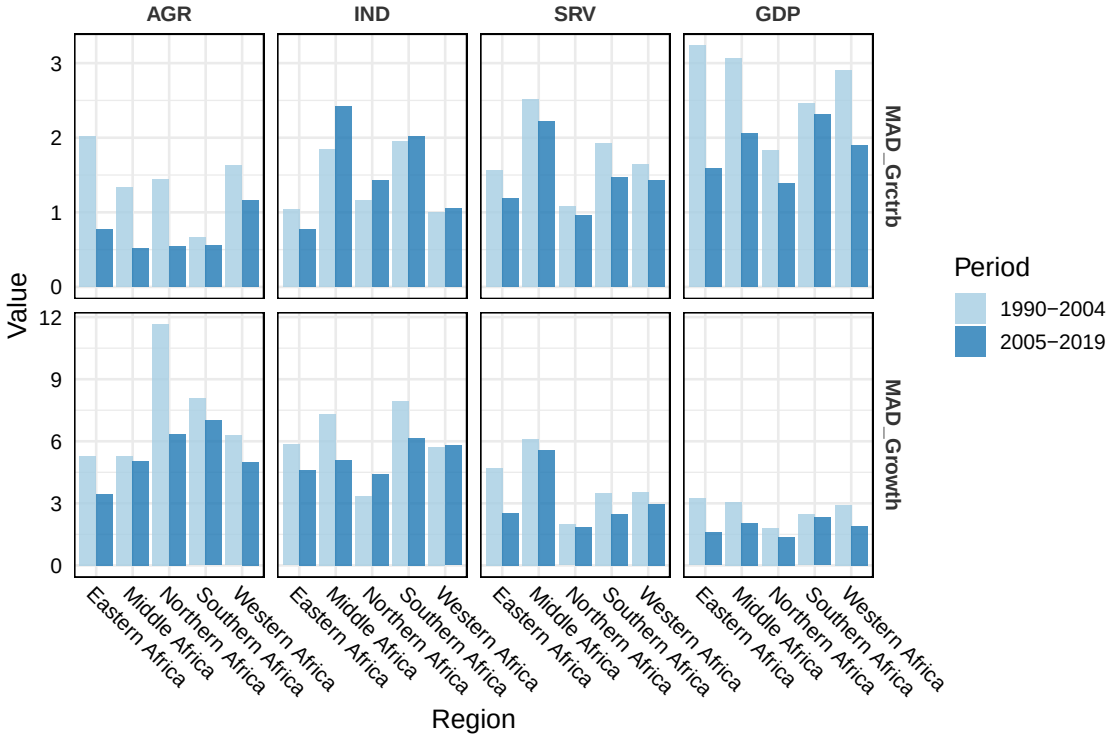


Data Source: World Development Indicators, Accessed November 2021

Table C9: Regions in Africa (51 Countries with Sectoral Data)

Region	Countries ISO3
Eastern Africa	BDI, COM, DJI, ETH, KEN, MDG, MOZ, MUS, MWI, RWA, SSD, SYC, TZA, UGA, ZMB, ZWE
Middle Africa	AGO, CAF, CMR, COD, COG, GAB, GNQ, SDN, STP, TCD
Northern Africa	DZA, EGY, MAR, TUN
Southern Africa	BWA, LSO, NAM, SWZ, ZAF
Western Africa	BEN, BFA, CIV, CPV, GHA, GIN, GMB, GNB, LBR, MLI, MRT, NER, NGA, SEN, SLE, TGO

Figure C17: Sectoral Growth Risk by Region



Data Source: World Development Indicators, Accessed November 2021

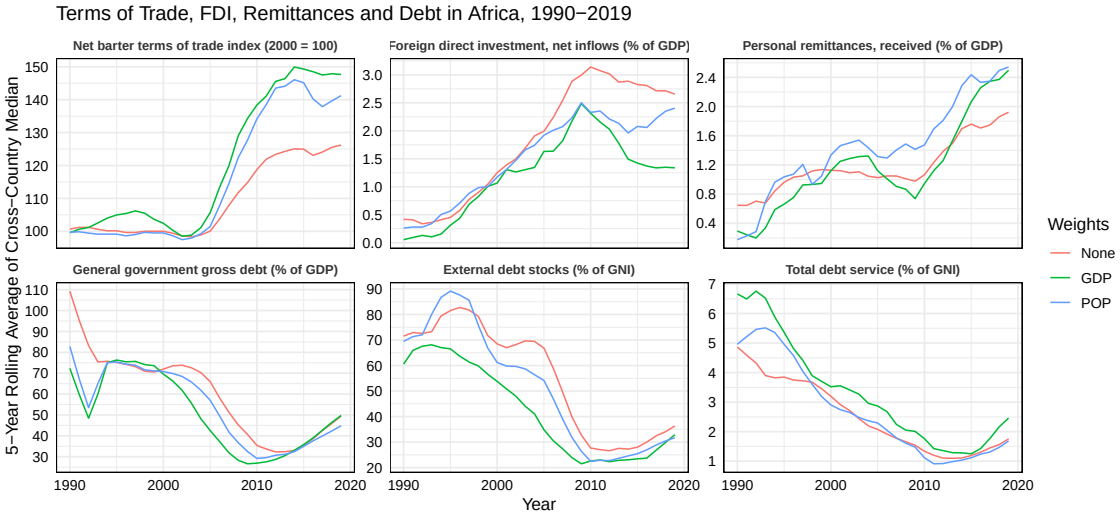
Table C10: Sectoral Growth Stabilization By Region

			(1) MAD($\Delta y_t/Y_{t-1}$)			(2) MAD(%Δy_t)		
Region	Period	N	AGR	IND	SRV	AGR	IND	SRV
Eastern	1990-2004	13	2.01	1.04	1.57	5.28	5.84	4.69
Eastern	2005-2019	16	0.77	0.78	1.19	3.45	4.62	2.54
Middle	1990-2004	8	1.34	1.84	2.51	5.28	7.30	6.12
Middle	2005-2019	10	0.51	2.42	2.21	5.04	5.11	5.57
Northern	1990-2004	4	1.44	1.15	1.07	11.65	3.36	1.98
Northern	2005-2019	4	0.54	1.42	0.96	6.37	4.40	1.85
Southern	1990-2004	5	0.66	1.95	1.92	8.06	7.94	3.50
Southern	2005-2019	5	0.56	2.01	1.47	7.00	6.18	2.48
Western	1990-2004	16	1.63	1.00	1.64	6.28	5.74	3.55
Western	2005-2019	16	1.16	1.06	1.43	5.01	5.80	2.98

Note: Statistics were aggregated across countries using the median.

Section 4: External, Financial, and Policy Factors

Figure C18: External Environment: Selected Indicators



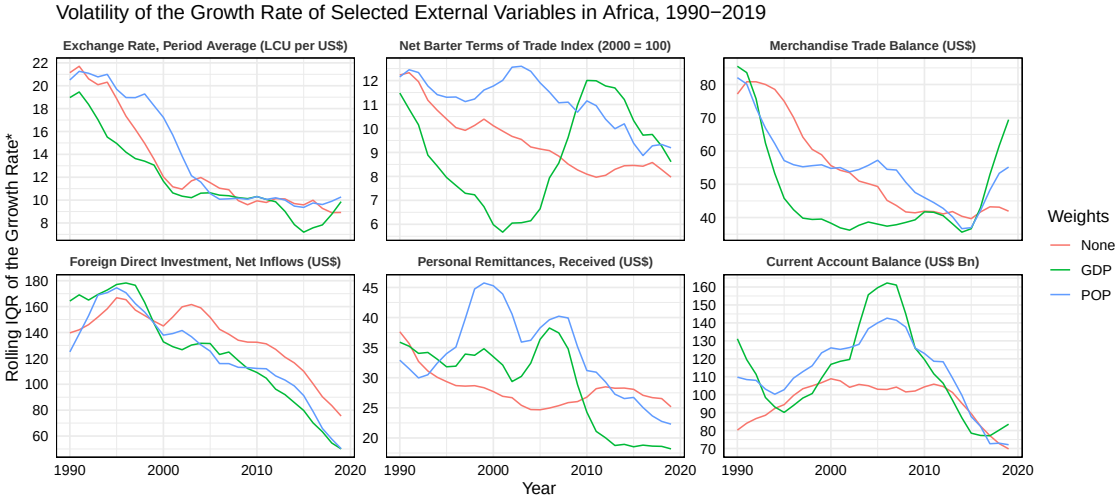
Data Source: IMF and World Bank. Accessed through the africamonitor API.

Table C11: Correlations with External Environment Indicators

Mean:	ToT	FDI	REM	GGDT	EDT	EDS
Median PC Growth	.065*	.177*	.053	-.271*	-.208*	-.045
MAD PC Growth	-.116*	-.052	-.074*	.091*	.104*	.039
Median Inflation	-.057*	-.039	-.083*	.117*	.187*	.084*
MAD Inflation	-.077*	-.031	-.017	.098*	.067*	.035

Notes: A 10-year MA with data from 1981 is used to smooth the variables shown in Figure C18 (in % of GDP/GNI terms), and 10-year rolling medians and MADs for per-capita growth and inflation. These rolling series are then standardized within each country, and first-differenced. Pairwise Pearson's correlations are computed on these first differences across all countries. A star denotes significance at the 5% level.

Figure C19: External Environment Volatility: Selected Indicators



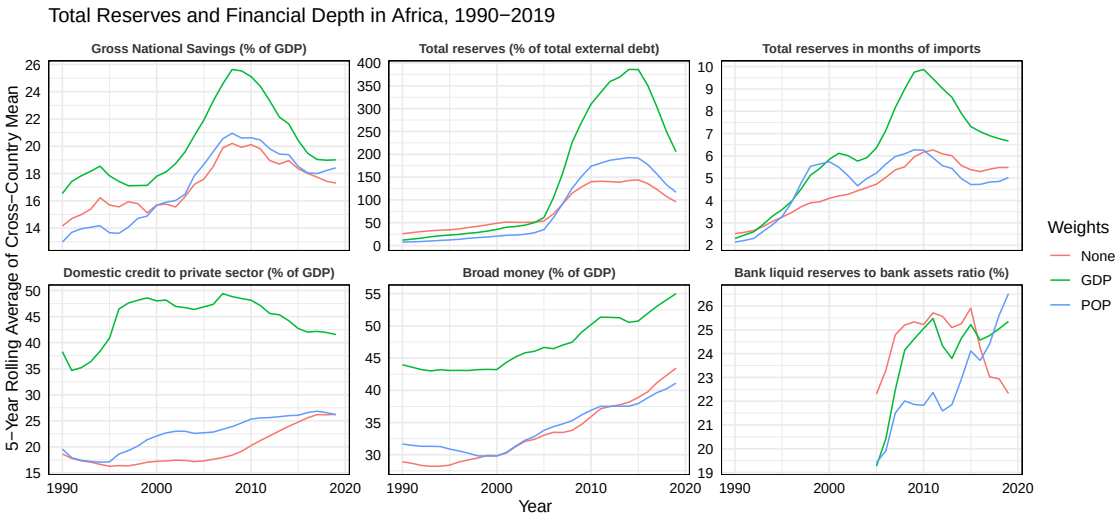
Data Source: IMF and World Bank. Accessed through the africamonitor API.
**Note: Plots show a 5−year MA of the cross−country (weighted) median of a 10−year rolling IQR of the growth rate of the series.*

Table C12: Correlations with External Environment Volatility Indicators

MAD:	E_PA	ToT	TB	FDI	REM	CAB
Median PC Growth	-.173*	-.202*	-.116*	-.034	-.115*	.000
MAD PC Growth	.043	.263*	.093*	.206*	.265*	.153*
Median Inflation	.911*	.299*	.058	.134*	.243*	.048
MAD Inflation	.915*	.295*	.032	.132*	.321*	.060*

Notes: 10-year rolling medians and MADs of the growth rates of the data from 1981 are computed for each country and related through pairwise Pearson's correlations across all countries. A star denotes significance at the 5% level.

Figure C20: Reserves and Financial Depth: Selected Indicators



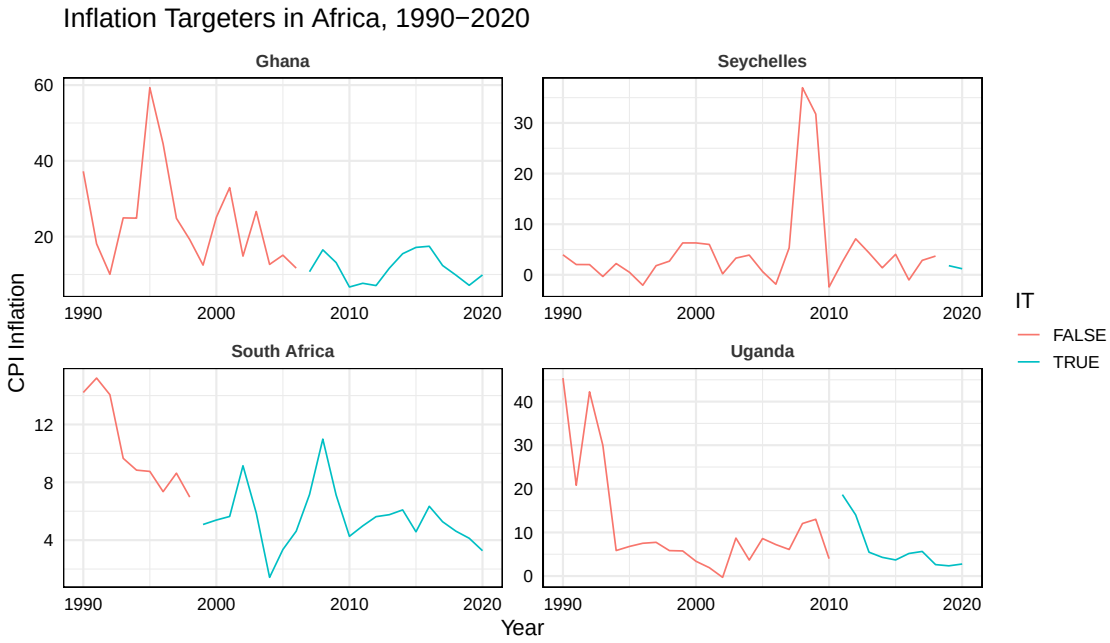
Data Source: IMF and World Bank. Accessed through the africamonitor API.

Table C13: Correlations with Financial Indicators

Mean:	GNS	TR_EDT	TR_MIM	PSC	BM	BLR_A
Median PC Growth	.073*	.249*	.093*	.086*	.072*	-.017
MAD PC Growth	-.024	-.077*	.060	-.106*	-.078*	.035
Median Inflation	-.056*	-.160*	-.050	-.098*	-.090*	-.011
MAD Inflation	-.004	-.035	.006	-.074*	-.078*	-.126*

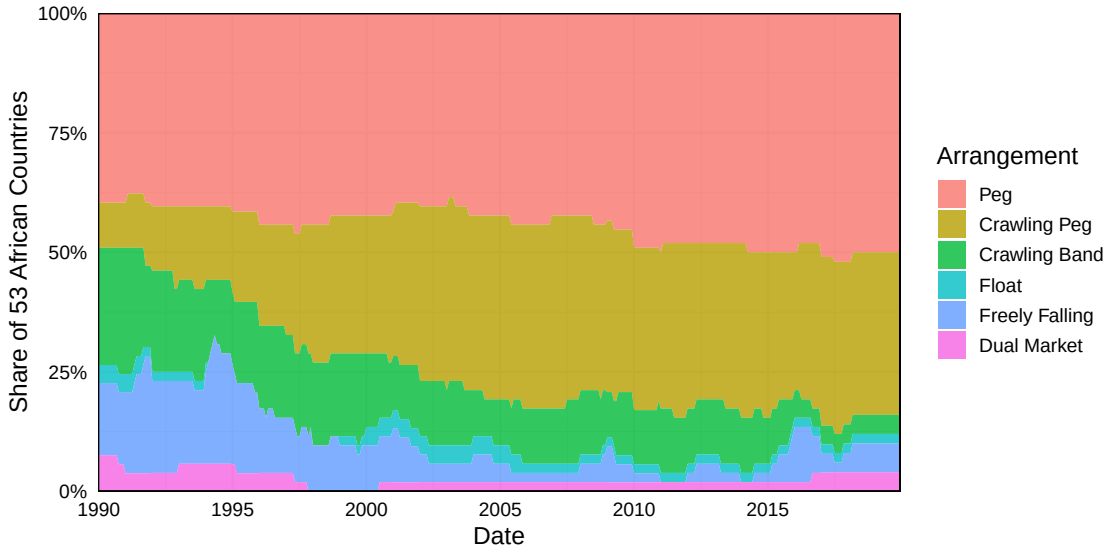
Notes: A 10-year MA with data from 1981 is used to smooth the variables shown in Figure C20, and 10-year rolling medians and MADs for per-capita growth and inflation. These rolling series are then standardized within each country, and first-differenced. Pairwise Pearson's correlations are computed on these first differences across all countries. A star denotes significance at the 5% level.

Figure C21: Inflation Targeting in Africa



Data Source: IMF World Economic Outlook, October 2021

Figure C22: Exchange Rate Regimes in Africa, 1990-2019



Data Source: Ilzetzki, Reinhart and Rogoff (2019)

Notes: The figure shows the 'coarse' exchange rate regime classification from Ilzetzki et al. (2019) with 6 categories. The share of 53 African economies (excl. South Sudan) with different regimes is computed for each year from 1990-2019.

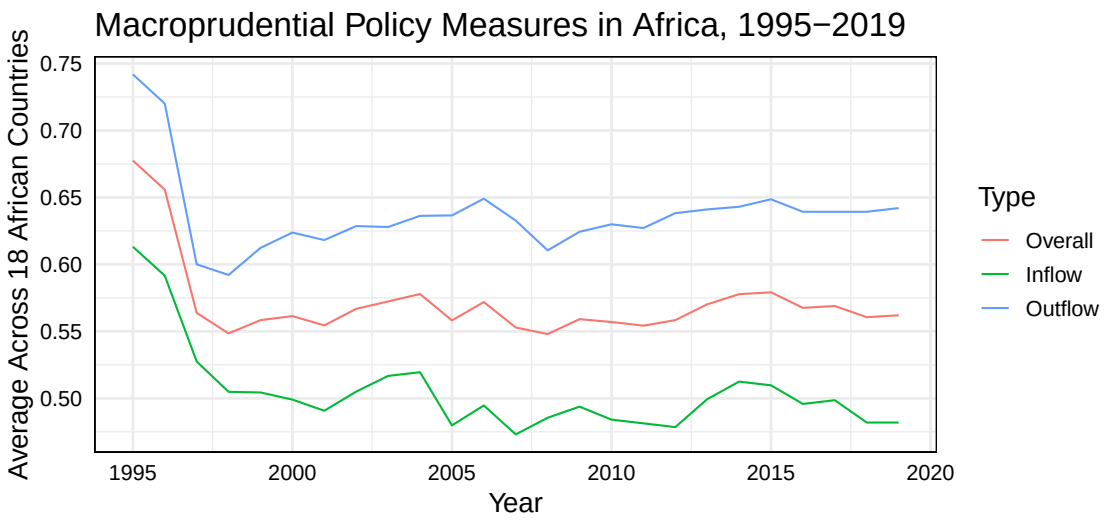
Table C14: Exchange Rate 15-Year Rolling Panel-Dummy-Regressions, 1990-2019

Dependent Variable:	MAD Real GDP/Capita Growth (%)			MAD Inflation (%)		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Crawling Peg	-0.5017***	-1.030**	-0.8594*	-0.2853	5.676	6.576
	(0.1213)	(0.4212)	(0.4743)	(0.4360)	(10.57)	(10.68)
Crawling Band	-0.7126**	0.2733	-0.0654	-0.5408	19.72**	18.62*
	(0.2486)	(0.6678)	(0.5721)	(2.155)	(8.871)	(9.523)
Float	-1.227***	1.325	0.7436	-1.756	46.70*	46.38*
	(0.1489)	(1.067)	(0.7344)	(1.161)	(22.06)	(21.93)
FF + DM	0.3907***	1.288***	0.4496	46.42**	117.5***	114.7***
	(0.1044)	(0.3280)	(0.2781)	(17.21)	(26.13)	(27.07)
Fixed-effects						
Country	–	52	52	–	52	52
Year	–	–	15	–	–	15
Fit statistics						
Observations	751	751	751	759	759	759
R^2	0.026	0.733	0.743	0.198	0.474	0.477
Within R^2		0.030	0.010		0.254	0.220

Driscoll & Kraay (1998) (L=1) standard-errors in parentheses *Signif. Codes:* ***: 0.01, **: 0.05, *: 0.1
Avg. Country Group Sizes: Peg: 22.8, Crawling Peg: 17, Crawling Band: 6.4, Float: 1, FF: 2.9, DM: 0.9

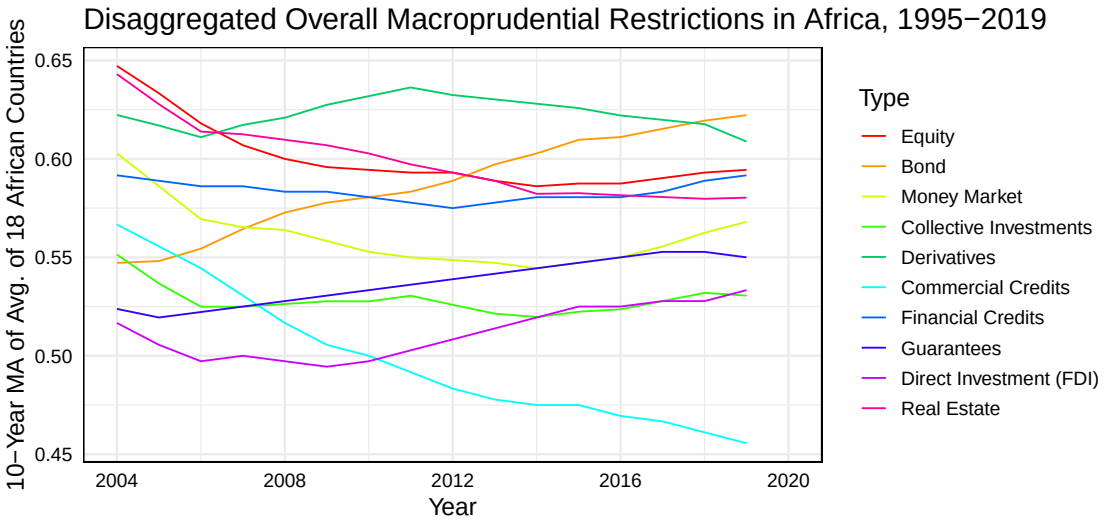
Notes: 15-year MAs of the exchange regime dummies on data from 1990-2019 (retaining 15 observations per country) are regressed onto 15-year rolling MADs of GDP per capita growth and CPI inflation. Data from WEO, Oct. 21.

Figure C23: Macroprudential Measures in Africa



Data Source: Fernandez, Klein, Rebucci, Schindler and Uribe (2016, 2021)

Figure C24: Disaggregated Macroprudential Measures in Africa



Data Source: Fernandez, Klein, Rebucci, Schindler and Uribe (2016, 2021)

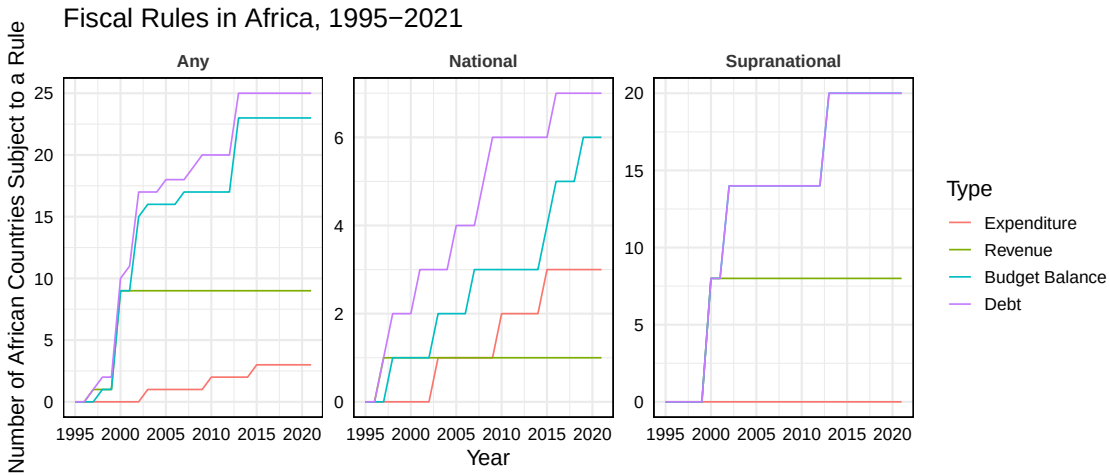
Table C15: Macroprodential Policy: 10-Year Rolling Panel-Regressions, 1995-2019

Dependent Variables:	MAD Real GDP/Capita Growth (%)			MAD Inflation (%)		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Overall Measures	0.1724	-5.095***	-5.368***	2.497	-10.23*	-12.17***
	(0.1264)	(0.7261)	(0.7969)	(1.966)	(4.871)	(3.644)
R^2	0.004	0.512	0.602	0.007	0.344	0.388
Within R^2		0.153	0.196		0.004	0.007
Inflow Measures	0.3058***	-0.5994	-2.215***	9.942*	-7.188***	-21.25***
	(0.0654)	(0.7604)	(0.5578)	(5.142)	(2.314)	(2.018)
Outflow Measures	-0.0717	-4.096***	-3.050***	-5.008**	-3.473	5.768
	(0.1187)	(1.034)	(0.9308)	(1.978)	(3.277)	(4.398)
R^2	0.006	0.520	0.603	0.035	0.344	0.392
Within R^2		0.167	0.197		0.004	0.013
Fixed-effects						
Country	–	18	18	–	18	18
Year	–	–	16	–	–	16
Observations	288	288	288	287	287	287

Driscoll & Kraay (1998) (L=2) standard-errors in parentheses *Signif. Codes:* ***: 0.01, **: 0.05, *: 0.1

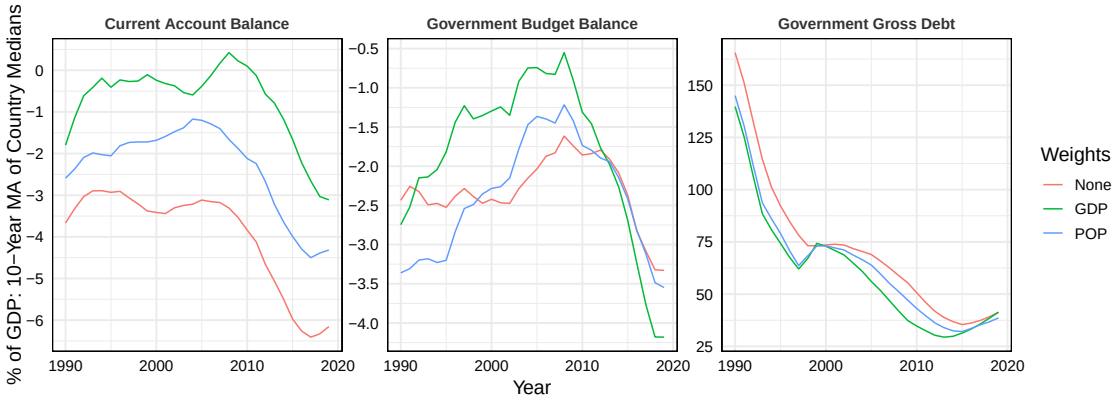
Notes: 10-year rolling MADs of GDP per capita growth and CPI Inflation from the WEO Oct. 21 are regressed onto 10-year MAs of overall, inflow and outflow measures taken from the macroprudential database of Fernández et al. (2016) (August 2021 update) and available for 18 African economies: Algeria, Angola, Burkina Faso, Cote d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Kingdom of Eswatini, Mauritius, Morocco, Nigeria, South Africa, Tanzania, Togo, Tunisia, Uganda, and Zambia.

Figure C25: The Adoption of Fiscal Rules in Africa



Data Source: IMF Fiscal Rules Dataset, 2022

Figure C26: Important Macroeconomic and Fiscal Aggregates, 1990-2019



Data Source: IMF World Economic Outlook, October 2021

Table C16: Fiscal Rules: 10-Year Rolling Panel-Regressions with Data from 1990-2019

Dependent Variables:	MAD Real GDP/Capita Growth (%)			MAD Inflation (%)		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Any Rule	-0.4450	-0.8644***	0.7599*	-1.832***	-1.886***	0.5127
	(0.3045)	(0.1213)	(0.3743)	(0.2925)	(0.2921)	(0.4207)
R^2	0.008	0.710	0.732	0.148	0.448	0.504
Within R^2		0.070	0.011		0.163	0.003
N. Rules	-0.2174**	-0.3574***	0.2266**	-0.6190***	-0.8204***	-0.0546
	(0.0998)	(0.0463)	(0.0831)	(0.1196)	(0.1126)	(0.1158)
R^2	0.015	0.710	0.731	0.123	0.461	0.503
Within R^2		0.070	0.007		0.184	< 0.001
Rule Dummies						
ER	-1.012***	0.3297*	0.4739**	-0.8629***	0.2318	0.4147
	(0.0984)	(0.1843)	(0.2173)	(0.2966)	(0.1978)	(0.2470)
RR	-1.115***	0.4285**	0.5313***	0.0267	-1.890***	-1.559***
	(0.0951)	(0.1581)	(0.1674)	(0.1617)	(0.1814)	(0.1607)
BBR	0.6600***	-0.9849***	-0.4113**	-0.2630	-0.7664**	-0.1291
	(0.1413)	(0.1603)	(0.1843)	(0.1701)	(0.3150)	(0.3817)
DR	-0.2568	-0.2262	0.6215*	-1.497***	-0.5366	1.158*
	(0.2932)	(0.2273)	(0.3534)	(0.2762)	(0.4100)	(0.5931)
R^2	0.050	0.716	0.733	0.145	0.474	0.524
Within R^2		0.088	0.016		0.203	0.042
Fixed-effects						
Country	–	25	25	–	25	25
Year	–	–	21	–	–	21
Observations	512	512	512	509	509	509

Driscoll & Kraay (1998) (L=2) standard-errors in parentheses *Signif. Codes:* ***: 0.01, **: 0.05, *: 0.1

Notes: 10-year rolling MADs of GDP per capita growth and CPI Inflation from the WEO Oct. 21, are regressed onto 10-year MAs of fiscal rule dummies from Davoodi et al. (2022b). 26 African countries are recorded to have introduced fiscal rules since 1990 (see Table 7). 3 sets of regressions are run: with an 'Any Rule' dummy indicating the presence of a fiscal rule, an ordinal 'N. Rules' variable, obtained as the sum of dummies for 4 different types of rules, and with the 4 dummies: expenditure (ER), revenue (RR), budget balance (BBR), and debt (DR).

Table C17: Fiscal Rules: Panel-Regression in 30-Year Panel with Data from 1990-2015

Dependent Variables:	Current Account Balance			Government Budget Balance			Government Gross Debt		
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Any Rule	0.3748	0.1935	1.155	7.645*	8.740*	3.671	-32.86***	-37.18***	-38.99***
	(1.011)	(1.078)	(1.558)	(4.415)	(5.080)	(3.112)	(9.081)	(7.913)	(9.958)
R^2	0.0003	0.260	0.306	0.013	0.143	0.201	0.057	0.434	0.506
Within R^2		< 0.001	0.001		0.016	0.001		0.089	0.046
N. Rules	0.0977	0.0135	0.1347	2.478	2.800	-0.5224	-10.02***	-9.074***	-2.196
	(0.2358)	(0.3457)	(0.3715)	(1.529)	(1.749)	(0.9959)	(2.554)	(2.256)	(1.959)
R^2	<0.001	0.260	0.306	0.010	0.138	0.200	0.039	0.396	0.483
Within R^2		< 0.001	<0.001		0.010	<0.001		0.029	<0.001
ER	4.603***	-6.162***	-5.470**	-0.5070	-13.63**	-11.48*	-26.55***	43.71***	51.35***
	(1.078)	(2.061)	(2.118)	(1.492)	(6.335)	(6.287)	(5.545)	(7.603)	(6.510)
RR	-0.2078	-3.274	-4.546*	-1.307	-17.77*	-25.20**	-1.093	28.14***	8.131
	(1.662)	(2.140)	(2.283)	(0.9910)	(9.362)	(11.35)	(3.214)	(9.968)	(4.862)
BBR	3.246**	3.576***	4.238***	2.788**	7.615	7.374	-7.840	45.23***	51.17***
	(1.577)	(1.142)	(1.270)	(1.291)	(5.273)	(4.772)	(4.624)	(9.988)	(9.414)
DR	-3.138	-0.9916	0.1215	5.647	10.22*	7.303*	-18.55*	-83.44***	-71.83***
	(2.140)	(1.437)	(1.592)	(3.375)	(5.305)	(3.979)	(10.28)	(12.17)	(11.66)
R^2	0.014	0.274	0.322	0.013	0.160	0.225	0.049	0.469	0.542
Within R^2		0.018	0.024		0.035	0.032		0.145	0.115
Fixed-effects									
Country	–	26	30	–	26	30	–	26	30
Year	–	–	26	–	–	26	–	–	26
Observations	749	749	749	673	673	673	586	586	586

Driscoll & Kraay (1998) (L=2) standard-errors in parentheses, dependent variables in % of GDP. *Signif. Codes:* ***: 0.01, **: 0.05, *: 0.1

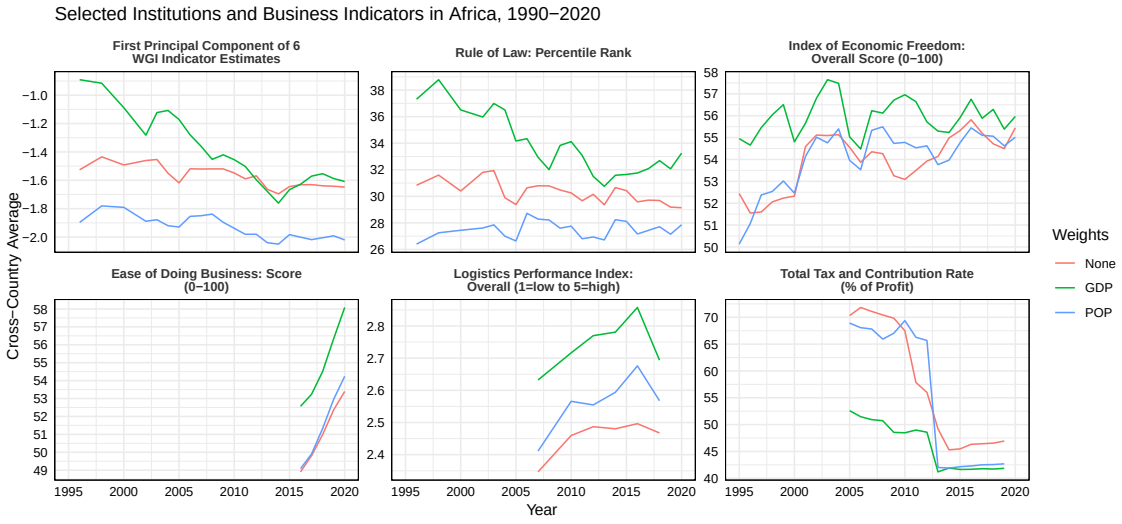
Section 5: Structural Factors

Table C18: Summary Statistics of Predictors in Cross-Sectional and Panel Analysis

Panel	*Topic* / Variables	N	Ndist	Mean	Median	SD	Min	Max
	Institutions							
	Overall Governance	49	49	49.67	48.57	12	26.35	78.06
X	Worldwide Governance Indicators: PC1	49	49	-1.47	-1.49	1.39	-3.97	1.88
	Human Rights and Rule of Law	49	49	7	7.17	1.53	3.76	9.79
X	Level of Democracy (Freedom House)	49	37	5.27	5	2.64	0.75	10
	50-Year Average Freedom House Ratings	48	29	2.44	2.5	0.5	1	3
X	Regime Durability	47	45	12.51	10.28	9.77	2	39
	Colonial Origin: British	49	2	0.39	0	0.49	0	1
	Colonial Origin: French	49	2	0.39	0	0.49	0	1
	Corruption Perceptions Index	48	44	33.77	32.69	11.35	17	62.25
	Business Environment							
	Ease of Doing Business Score (0-100)	49	47	50.71	50.25	10.99	21.15	77.70
	Logistics Performance Index (1-5)	46	40	2.48	2.47	0.24	2.03	3.50
X	Index of Economic Freedom (0-100)	49	46	53.76	54.80	7.30	34.60	73
X	The Property Right Protection Index	49	49	49.79	50.00	2.12	46.49	54.38
	Production Shares							
X	Agriculture, Forestry & Fishing VA (% of GDP)	49	49	20.89	22.11	13.18	1.33	51.19
X	Industry & Construction VA (% of GDP)	49	49	26.72	22.84	14.73	11.52	77.54
	Climate & Agriculture							
X	Permanent Cropland (% of Land Area)	49	49	4.01	0.74	7.66	0.002	40.62
X	Ln(Cereal Yield, Kg/Ha)	47	47	7.03	7.08	0.61	5.45	8.88
X	Annual Average Rainfall	49	49	82.27	82.98	52.86	2.78	206.82
X	Annual Average Temperature	49	49	24.31	24.48	3.34	12.67	28.87
	% 1995 Pop. in Tropics (Af+Am+Aw)	44	28	46.39	43.04	42.42	0	100
X	% of Cropland Equipped for Irrigation	47	46	7.75	2.11	15.79	0.05	99.81
	Irrigation Suitability 1 (%)	44	44	4.12	3.64	2.81	0.16	13.41
	Soil Suitability 1 (%)	44	44	9.37	7.43	7.79	0.15	32.01
	Trade Intensity and Composition							
X	Merchandise Trade (% of GDP)	49	49	52.39	46.59	25.36	19.22	128.68
X	Agricultural Raw Materials Exports (% of GDP)	47	47	0.96	0.34	1.43	0	7.01
X	Manufactures Exports (% of GDP)	47	47	5.78	1.37	9.08	0.001	35.54
X	Ores and Metals Exports (% of GDP)	47	47	2.49	0.21	4.92	0.0003	22.52
X	Merchandise Exports to HICs (% of GDP)	49	49	13.59	9.90	12.18	0.61	53.02
X	Merch. EX to LMICs Outside Region (% of GDP)	49	49	3.02	1.94	3.87	0.05	17.34
X	Merchandise Imports from HICs (% of GDP)	49	49	15.07	12.76	9.23	3.69	53.41
	Trade Diversification							
X	Herfindahl Index of Bilateral Trade (X+M)	48	48	0.13	0.09	0.10	0.04	0.47
X	Theil Index of Bilateral Trade (X+M)	48	48	2.03	1.87	0.45	1.39	3.29
X	Herfindahl Index of Exports by Product	47	47	0.30	0.27	0.24	0.03	0.92
X	Theil Index of Exports by Product	47	47	3.41	3.32	0.94	1.43	5.46
	Exchange Rate and Terms of Trade							
X	Exchange Rate Growth (%)	49	35	5.32	2.90	7.37	-0.01	44.28
X	MAD Nominal Exchange Rate Depreciation (%)	49	37	10.36	7.94	9.17	0.91	63.23
X	Net Barter Terms of Trade Index (2000 = 100)	49	49	113.10	110.16	20.36	65.92	162.62
X	Terms of Trade Growth (%)	49	46	0.44	0	2.12	-4.37	9.00
X	MAD Terms of Trade Growth (%)	49	49	9.14	7.45	5.70	0.84	24.36
	Financial & Aid Flows							
X	Net FDI Inflows (% of GDP)	49	49	2.52	2.05	2.15	0.04	9.69
X	MAD Diff(FDI in % of GDP)	49	49	1.98	1.29	2.26	0.07	12.88
X	Personal Remittances, Received (% of GDP)	49	45	2.98	1.14	6.04	0	39.72
X	MAD Diff(Remittances in % of GDP)	49	45	0.46	0.21	0.75	0	4.77
X	Net ODA Received (% of GNI)	49	49	7.79	6.73	6.47	0.20	23.07
	Financial Sector							
X	Broad Money (% of GDP)	49	49	33.79	23.17	25.87	10.11	132.60
X	Broad Money Growth (%)	49	49	8.05	8.05	3.46	-0.03	17.16
X	MAD Broad Money Growth (%)	49	49	14.36	13.26	5.47	2.90	33.26
X	Domestic Credit to Private Sector (% of GDP)	49	49	20.87	13.13	22.95	2.37	118.17
X	Bank Liquid Reserves to Bank Assets Ratio (%)	46	46	21.70	18.83	14.46	3.50	59.29
	Bank/MM Account (% of Population Ages 15+)	42	42	30.47	28.44	19.75	6.71	82.21

Panel	*Topic* / Variables	N	Ndist	Mean	Median	SD	Min	Max
	Debt & Reserves							
X	General Government Gross Debt (% of GDP)	48	48	56.24	52.95	31.71	12.92	198.71
X	External Debt Stocks (% of GNI)	45	45	62.83	55.79	35.70	12.71	196.62
X	Total Debt Service (% of GNI)	45	45	2.85	2.08	2.34	0.62	12.54
X	Total Reserves in Months of Imports	41	41	4.62	2.99	6.03	0.07	28.19
	Population							
X	Ln(Population)	49	49	15.76	16.11	1.62	11.33	18.74
X	Population Growth (Annual %)	49	49	2.39	2.57	0.78	0.61	4.10
X	Urban Population (% of Total Population)	49	49	39.38	38.02	16.88	9.26	82.12
X	Ln(Population Density, People/Km2)	49	49	3.68	3.88	1.33	0.85	6.40
X	Age Dependency Ratio (% of Work. Age Pop.)	49	49	83.26	87.86	15.71	45.86	106.47
X	International Migrant Stock (% of Population)	49	49	3.13	2.26	3.46	0.15	15.55
	Health							
X	Life Expectancy at Birth, Total (Years)	49	49	57.22	55.66	7.81	43.98	74.13
X	Infant Mortality Rate (per 1000 Live Births)	49	49	63.75	67.15	26.01	12.20	125.65
X	% of People using Basic Sanitation Services	49	49	38.27	31.45	26.67	5.81	98.17
	% Pop. at Risk of Malaria, 2005	44	14	75.21	100	40.01	0	100
	Malaria Ecology (Sachs, 2003)	47	47	10.16	7.51	8.53	0	31.55
	Education							
X	Human Capital Index	49	49	0.53	0.55	0.17	0.16	0.82
X	Mean Years of Schooling	49	36	4.37	4.30	1.93	1.30	8.90
X	Expected Years of Schooling	49	39	9.12	9	2.60	3.70	15.40
X	Adult Literacy (% of People Ages 15+)	49	49	62.83	67.09	19.91	23.00	93.00
	% of Pop. Speaking Major European Language	48	11	3.37	0	12.88	0	70.00
	Natural Disasters & Conflict							
X	Natural Disasters: Ln(N. Homeless)	49	45	9.39	10.91	3.81	0	13.83
X	Natural Disasters: Ln(N. Deaths)	49	49	6.84	7.27	2.12	1.39	10.13
X	Natural Disasters: Ln(Damage in USD)	49	39	8.69	10.34	5.27	0	15.69
X	Ln(ACLED Fatalities, 1997-2019)	44	44	7.49	7.60	2.50	1.39	11.88
	Societal Violence Scale Index (1-5)	48	13	3.44	3.58	0.92	1.50	5
X	State Fragility Index	47	43	14.36	15.04	4.88	1.33	23.33
	Geography & Accessibility							
	Geogr. Predicted Trade (FR 1999)	48	48	-3.07	-3.08	0.50	-3.98	-2.16
	% Area 100km from Coast/Sea-Nav. River	44	32	20.61	12.09	26.19	0	100
	Sub-Saharan Africa Dummy	49	2	0.90	1	0.31	0	1
	Landlocked Dummy	48	2	0.27	0	0.45	0	1
	Internal Distance Based on Area	48	48	232.83	205.27	159.59	8.02	595.40
	Latitude in Degrees	48	47	2.52	4.85	17.41	-33.93	36.83
	Longitude in Degrees	48	47	15.08	14.12	20.75	-23.50	57.50
	Natural Resources							
X	Total Natural Resources Rents (% of GDP)	49	49	10.88	7.37	10.58	0.01	42.04
X	Oil Rents (% of GDP)	49	20	4.48	0	10.16	0	40.52
	Poverty & Inequality							
X	% Poor at $1.90 a Day (2011 PPP)	46	44	39.11	41	23.95	0.40	85.75
X	Poverty Gap at $1.90 a Day (2011 PPP) (%)	46	45	15.96	15.03	12.46	0.10	51.70
X	Gini Index	46	44	43.37	41.68	7.87	31.45	63
	Religion & Ethnicity							
	Religion: Muslim, 1980	45	38	32.82	16.20	36.80	0	99.40
	Religion: Protestant, 1980	45	35	11.52	4.90	13.25	0	50
	Religion Fractionalization, 2000	49	49	0.47	0.58	0.27	0.003	0.86
	Ethnic Fractionalization, 2000	48	47	0.62	0.71	0.25	0	0.93
	Others							
X	Index of Globalization	49	49	44.31	43.29	8.33	28.37	62.70
X	Human Development Index	49	49	0.49	0.48	0.12	0.30	0.76
	Ln(GDP per Capita 1960)	42	41	6.57	6.51	0.54	5.52	7.94
X	Ln(GDP per Person Employed)	47	47	9.16	8.96	1.04	7.51	11.16
X	Access to Electricity (% of Population)	49	49	41.00	34.75	29.66	5.05	99.40
X	Gross National Savings (% of GDP)	48	48	17.38	15.81	9.14	2.31	37.98

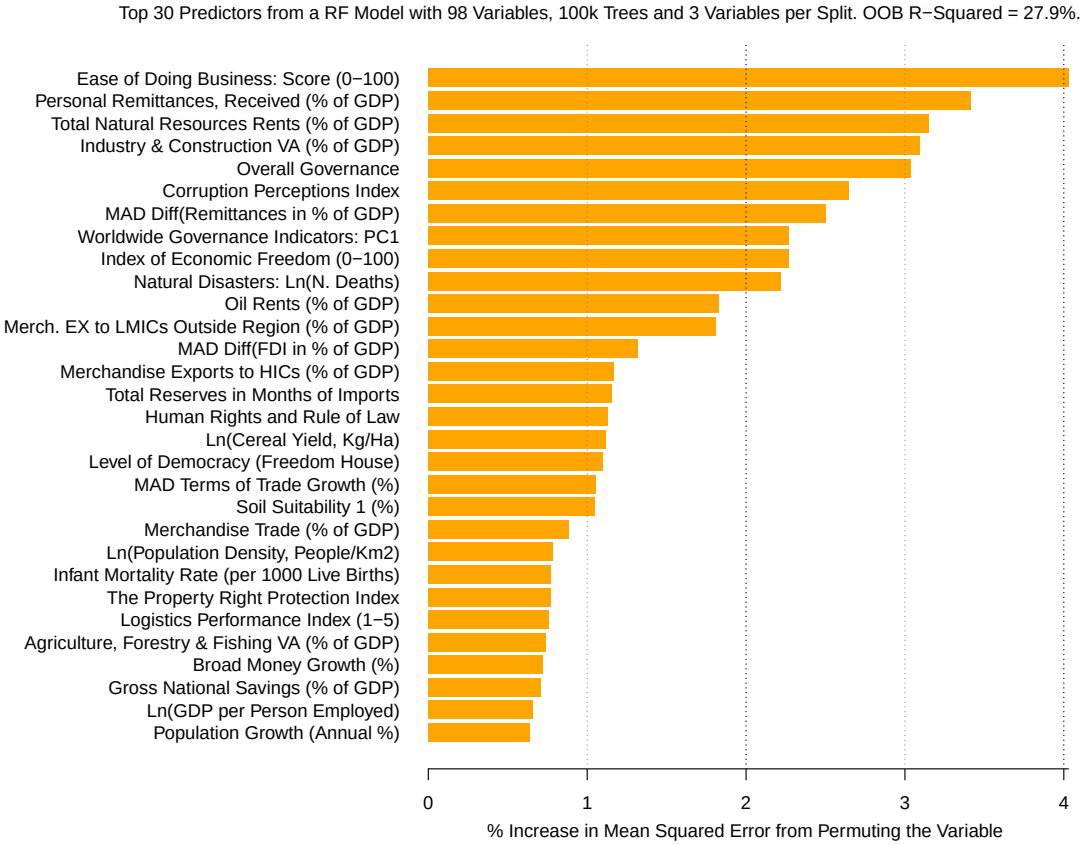
Figure C27: Institutions and Business Environment: Selected Indicators



Source: IMF and World Bank. Accessed through the africamonitor API.

Cross-Sectional Results

Figure C28: RF Predicting the MAD of PCGDP Growth of 49 African Economies in 1990-2019



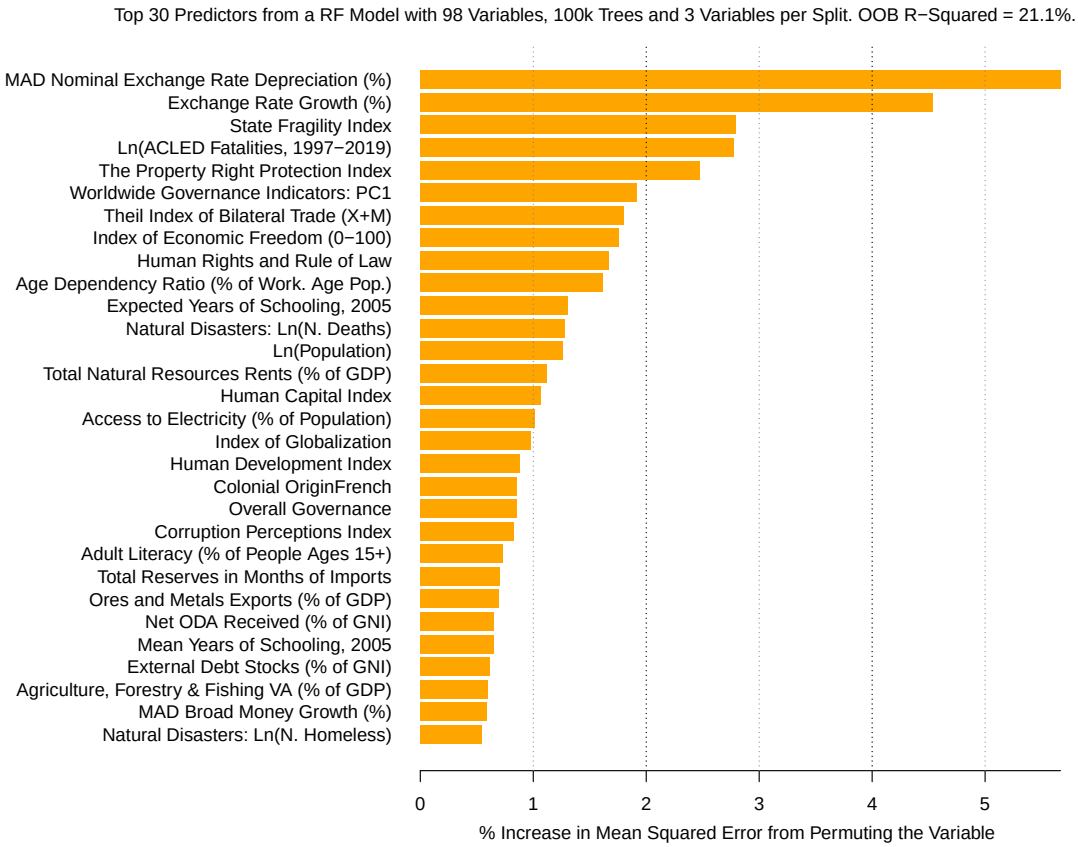
Notes: The Random Forest model is fit following Breiman (2001), using the *ranger* R package (Wright & Ziegler, 2017). Each tree is fit on a bootstrap sample of the data, randomly choosing 3 variables at each split. The Out-of-Bag (OOB) R^2 is computed using each tree to predict only the data excluded from the bootstrap sample used to grow the tree, and averaging the predictions from all trees, yielding an OOB fit used to compute the R^2. Table C18 summarises the variables. 2.5% missing values were imputed beforehand following Stekhoven & Bühlmann (2012) with R package *missRanger*.

Table C19: RF Ranking of Indicator Topics: Predicting MAD PCGDP Growth, 1990-2019

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Institutions	88.03	1	6.38	1	40.89	4	2.00
Financial & Aid Flows	73.47	2	4.29	2	43.69	3	2.33
Trade Intensity and Composition	57.63	4	1.90	7	53.93	1	4.00
Financial Sector	65.98	3	0.93	11	47.45	2	5.33
Business Environment	50.67	5	2.83	4	22.43	10	6.33
Natural Resources	28.81	12	3.20	3	34.28	5	6.67
Natural Disasters & Conflict	29.17	11	1.91	6	23.23	9	8.67
Production Shares	31.11	9	2.22	5	16.64	14	9.33
Population	31.17	8	0.75	12	27.72	8	9.33
Exchange Rate and ToT	29.18	10	0.39	14	29.41	7	10.33
Climate & Agriculture	45.07	6	-0.02	15	14.52	15	12.00
Health	16.62	16	1.47	8	20.49	12	12.00
Others	28.06	13	-0.21	18	31.10	6	12.33
Geography & Accessibility	20.78	14	-0.06	16	22.34	11	13.67
Trade Diversification	20.78	15	-0.12	17	18.50	13	15.00
Debt & Reserves	32.33	7	-0.57	19	5.39	19	15.00
Education	13.00	17	1.38	10	11.14	18	15.00
Poverty & Inequality	7.27	19	1.41	9	13.07	17	15.00
Religion & Ethnicity	10.90	18	0.55	13	14.12	16	15.67

Notes: The reports 3 methods to rank topics of predictors using Random Forests. *Permutation* permutes all predictors in a topic and calculates the percent increase in the Out-Of-Bag (OOB) MSE. *Exclusion* excludes all predictors from the topic, fits a new model, and obtains the percent increase in MSE to the full model. *Residual Fit* is like *Exclusion*, but additionally partials out the predictors from a topic using multivariate linear regression, and fits a new model using the residual predictors from all other topics.

Figure C29: RF Predicting the MAD of CPI Inflation of 49 African Economies in 1990-2019



Notes: See notes to Figure C28. The variables are summarised in Table C18.

Table C20: RF Ranking of Indicator Topics: Predicting MAD CPI Inflation, 1990-2019

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Exchange Rate and ToT	86.54	1	17.56	1	45.13	1	1.00
Natural Disasters & Conflict	72.25	2	5.16	2	32.71	2	2.00
Institutions	63.26	3	0.72	5	25.78	5	4.33
Business Environment	58.39	4	1.04	4	19.61	8	5.33
Population	44.53	5	-1.23	8	31.67	3	5.33
Trade Intensity and Composition	43.54	6	-2.22	13	29.10	4	7.67
Trade Diversification	38.31	9	1.20	3	-4.44	16	9.33
Financial Sector	43.36	7	-4.69	19	19.74	6	10.67
Education	12.74	17	-0.91	6	17.57	9	10.67
Geography & Accessibility	33.51	10	-1.43	10	16.25	12	10.67
Others	38.37	8	-2.75	18	19.68	7	11.00
Poverty & Inequality	23.94	13	-2.31	15	16.40	10	12.67
Health	20.53	15	-2.31	14	16.37	11	13.33
Natural Resources	18.40	16	-1.57	11	12.33	13	13.33
Debt & Reserves	26.00	12	-1.98	12	-13.25	18	14.00
Religion & Ethnicity	12.42	18	-1.39	9	-1.98	15	14.00
Production Shares	9.84	19	-0.97	7	-5.80	17	14.33
Financial & Aid Flows	22.82	14	-2.72	17	6.88	14	15.00
Climate & Agriculture	26.20	11	-2.51	16	-16.88	19	15.33

Notes: See notes for Table C19 and explanations provided in the text.

Results on Cross-Section of Differences

Figure C30: RF Predicting the MAD-Difference of PCGDP Growth of 49 African Economies

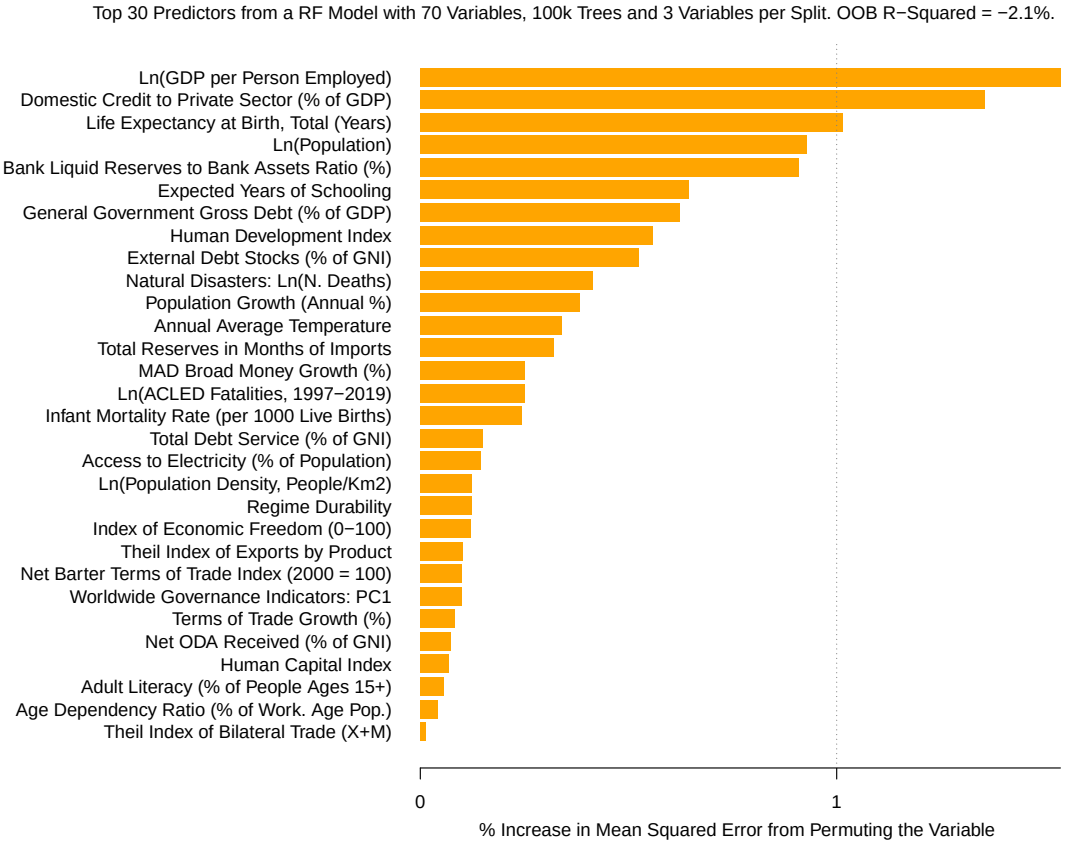


Table C21: RF Ranking of Indicator Topics: Predicting the MAD-Difference of PCGDP Growth

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Others	63.47	3	2.29	2	16.29	1	2.00
Financial Sector	68.48	2	7.05	1	7.84	7	3.33
Population	44.62	4	0.37	6	8.83	4	4.67
Health	34.72	6	0.37	5	1.21	11	7.33
Institutions	23.60	14	0.47	3	8.65	6	7.67
Education	24.29	13	0.30	7	13.37	3	7.67
Trade Intensity and Composition	74.42	1	-1.25	15	5.06	8	8.00
Climate & Agriculture	30.06	8	-0.28	12	8.75	5	8.33
Debt & Reserves	28.69	9	-1.38	16	13.44	2	9.00
Trade Diversification	33.82	7	-0.89	13	1.53	10	10.00
Natural Disasters & Conflict	39.17	5	-0.09	10	-3.17	17	10.67
Exchange Rate and ToT	27.29	10	-0.05	9	-0.87	15	11.33
Financial & Aid Flows	24.47	12	-0.15	11	0.78	12	11.67
Poverty & Inequality	16.19	16	0.42	4	-2.98	16	12.00
Natural Resources	25.97	11	-1.52	17	3.30	9	12.33
Business Environment	11.88	17	0.26	8	0.07	13	12.67
Production Shares	16.27	15	-0.92	14	-0.01	14	14.33

Figure C31: RF Predicting the MAD-Difference of CPI Inflation of 49 African Economies

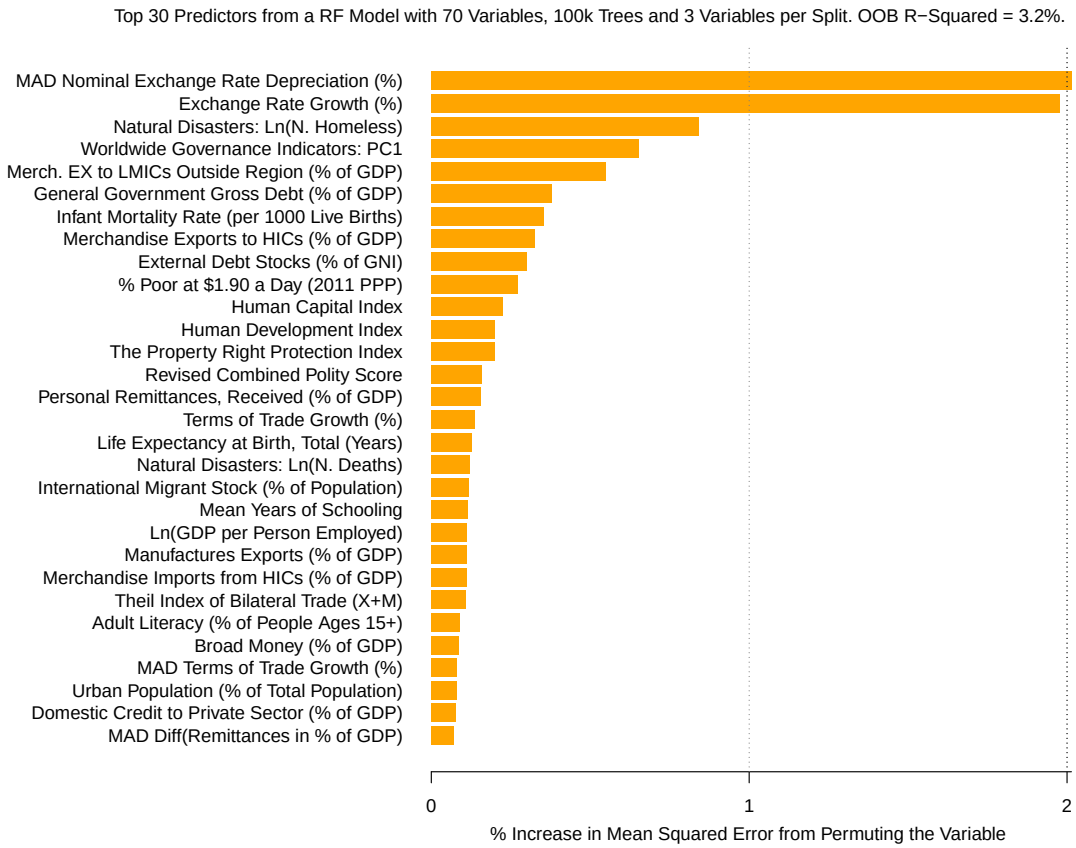


Table C22: RF Ranking of Indicator Topics: Predicting the MAD-Difference of CPI Inflation

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Exchange Rate and ToT	62.34	2	7.87	1	36.45	1	1.33
Population	68.14	1	-0.01	7	2.10	3	3.67
Debt & Reserves	61.76	3	-1.12	15	2.89	2	6.67
Institutions	22.22	13	0.55	2	1.35	6	7.00
Natural Disasters & Conflict	37.33	9	0.26	4	0.79	9	7.33
Trade Intensity and Composition	39.68	7	0.29	3	-1.69	13	7.67
Production Shares	38.81	8	0.05	6	0.41	10	8.00
Education	45.36	4	-0.03	8	-1.80	15	9.00
Natural Resources	4.70	17	0.18	5	1.43	5	9.00
Climate & Agriculture	32.01	10	-0.84	14	1.25	7	10.33
Financial Sector	42.28	5	-0.05	9	-5.75	17	10.33
Health	25.41	11	-0.37	10	-0.32	11	10.67
Poverty & Inequality	19.66	14	-1.28	16	1.61	4	11.33
Trade Diversification	23.90	12	-0.56	12	-1.20	12	12.00
Business Environment	5.95	16	-0.67	13	1.23	8	12.33
Financial & Aid Flows	42.13	6	-1.29	17	-2.60	16	13.00
Others	13.40	15	-0.42	11	-1.72	14	13.33

Cross-Sectional Prediction: With First 2 Principal Components for Each Topic

Table C23: Percent Variance Explained by First 2 Principal Components

		% Variance Explained		
Topic	N	PC1	PC2	Total
Institutions (excl. Colonial Origin)	7	66.86	16.29	83.16
Business Environment	4	76.24	13.38	89.62
Production Shares	2	82.30	17.70	100.00
Climate & Agriculture	8	34.76	21.51	56.27
Trade Intensity and Composition	7	35.04	20.03	55.07
Trade Diversification	4	51.14	27.62	78.75
Exchange Rate and ToT	5	42.81	34.21	77.02
Financial & Aid Flows	5	40.12	34.34	74.46
Financial Sector	6	40.30	24.56	64.86
Debt & Reserves	4	38.84	27.70	66.54
Population	6	39.68	24.03	63.71
Health	5	73.36	12.26	85.63
Education	5	73.77	18.01	91.79
Natural Disasters & Conflict	6	52.65	18.79	71.44
Geography & Accessibility	7	37.78	28.31	66.09
Natural Resources	2	93.18	6.82	100.00
Poverty & Inequality	3	68.30	30.29	98.59
Religion & Ethnicity	4	60.32	24.71	85.04
Others	6	69.91	11.03	80.94
Average	5.05	56.70	21.66	78.37

Table C24: RF Ranking of Indicator Topics: PC12 Predicting MAD PCGDP Growth, 1990-2019

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Financial Sector	114.50	1	2.48	3	34.07	3	2.33
Production Shares	61.84	4	4.47	1	29.96	5	3.33
Institutions	35.02	6	2.84	2	31.12	4	4.00
Financial & Aid Flows	102.31	2	1.65	4	29.21	6	4.00
Natural Resources	30.86	7	0.88	6	38.82	2	5.00
Trade Intensity and Composition	68.14	3	-1.36	14	48.70	1	6.00
Population	19.52	10	0.88	5	12.82	8	7.67
Trade Diversification	13.92	12	-0.42	8	1.57	14	11.33
Natural Disasters & Conflict	35.68	5	-1.10	13	0.78	16	11.33
Business Environment	23.65	9	-2.32	17	11.53	10	12.00
Exchange Rate and ToT	12.02	13	-1.87	16	19.43	7	12.00
Debt & Reserves	17.17	11	-2.60	18	12.00	9	12.67
Climate & Agriculture	11.98	14	-1.37	15	9.50	11	13.33
Geography & Accessibility	9.80	15	-0.38	7	-10.29	19	13.67
Poverty & Inequality	3.57	19	-0.72	10	2.19	12	13.67
Education	8.60	16	-0.45	9	-2.46	17	14.00
Religion & Ethnicity	5.53	18	-0.91	11	1.63	13	14.00
Health	6.07	17	-1.02	12	0.94	15	14.67
Others	25.18	8	-3.33	19	-3.09	18	15.00

Table C25: RF Ranking of Indicator Topics: PC12 Predicting MAD CPI Inflation, 1990-2019

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Exchange Rate and ToT	225.75	1	19.91	1	42.39	1	1.00
Institutions	58.74	4	1.30	2	23.53	3	3.00
Natural Disasters & Conflict	61.13	2	0.61	3	22.97	4	3.00
Business Environment	43.39	6	-0.01	5	11.64	7	6.00
Population	15.61	12	-0.01	4	26.71	2	6.00
Geography & Accessibility	19.32	9	-0.79	9	16.46	6	8.00
Natural Resources	59.37	3	-4.29	18	17.97	5	8.67
Others	20.09	8	-1.99	14	11.49	8	10.00
Financial Sector	17.26	11	-0.73	8	0.26	14	11.00
Trade Diversification	10.41	14	-0.22	6	0.16	15	11.67
Poverty & Inequality	44.91	5	-4.60	19	7.90	12	12.00
Health	11.58	13	-2.06	15	8.44	10	12.67
Climate & Agriculture	5.27	19	-0.30	7	3.23	13	13.00
Education	5.58	18	-0.86	10	8.21	11	13.00
Financial & Aid Flows	17.57	10	-1.54	12	-11.58	18	13.33
Religion & Ethnicity	9.38	15	-3.13	17	8.96	9	13.67
Debt & Reserves	38.12	7	-2.63	16	-19.02	19	14.00
Trade Intensity and Composition	9.08	17	-1.44	11	-0.28	16	14.67
Production Shares	9.08	16	-1.97	13	-1.67	17	15.33

Panel Prediction: With First 2 Principal Components for Each Topic

Table C26: Percent Variance Explained by First 2 Principal Components

		% Variance Explained		
Topic	N	PC1	PC2	Total
Institutions	3	47.87	40.35	88.22
Business Environment	2	61.01	38.99	100.00
Production Shares	2	73.69	26.31	100.00
Climate & Agriculture	5	35.72	21.57	57.29
Trade Intensity and Composition	7	38.79	23.46	62.26
Trade Diversification	4	43.20	22.48	65.69
Exchange Rate and ToT	5	40.17	28.43	68.61
Financial & Aid Flows	5	39.57	33.53	73.10
Financial Sector	5	36.74	27.05	63.79
Debt & Reserves	4	46.07	28.98	75.05
Population	6	44.68	22.30	66.98
Health	3	58.92	32.95	91.87
Education	4	40.36	28.70	69.06
Natural Disasters & Conflict	5	31.21	20.61	51.82
Natural Resources	2	80.75	19.25	100.00
Poverty & Inequality	3	68.51	27.15	95.66
Others	5	29.37	23.56	52.93
Average	4.12	48.04	27.39	75.43

Table C27: RF Ranking of Indicator Topics: PC12 Predicting MAD-Difference of PCGDP Growth

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Others	83.95	1	1.98	3	11.13	1	1.67
Exchange Rate and ToT	45.31	4	4.34	1	3.39	6	3.67
Financial Sector	35.92	7	2.24	2	4.56	3	4.00
Natural Resources	63.17	3	0.55	7	5.68	2	4.00
Institutions	44.60	5	1.21	5	4.00	4	4.67
Natural Disasters & Conflict	76.57	2	1.47	4	-5.28	17	7.67
Financial & Aid Flows	12.61	15	0.72	6	2.36	7	9.33
Health	25.13	9	-1.76	16	3.97	5	10.00
Debt & Reserves	26.06	8	-0.91	15	1.72	8	10.33
Trade Intensity and Composition	36.89	6	-0.87	14	-2.50	12	10.67
Population	19.11	10	-0.24	11	-1.43	11	10.67
Business Environment	13.99	13	-0.07	9	-3.23	13	11.67
Climate & Agriculture	7.50	17	-0.13	10	0.89	9	12.00
Production Shares	17.46	12	-0.70	13	-3.26	14	13.00
Trade Diversification	17.49	11	-0.67	12	-4.90	16	13.00
Poverty & Inequality	11.56	16	0.09	8	-3.68	15	13.00
Education	13.49	14	-1.91	17	0.43	10	13.67

Table C28: RF Ranking of Indicator Topics: PC12 Predicting MAD-Difference of CPI Inflation

Method:	Permutation		Exclusion		Residual Fit		Combined
Topic	%ΔMSE	Rank	%ΔMSE	Rank	%ΔMSE	Rank	Avg. Rank
Exchange Rate and ToT	106.41	1	8.15	1	25.13	1	1.00
Debt & Reserves	43.52	5	0.15	6	5.97	2	4.33
Production Shares	96.40	2	1.52	2	0.86	12	5.33
Poverty & Inequality	6.23	13	0.25	4	2.58	6	7.67
Climate & Agriculture	38.44	6	-0.15	8	0.97	11	8.33
Natural Resources	8.82	12	-0.20	10	3.66	3	8.33
Health	72.33	3	-0.68	15	1.28	8	8.67
Education	46.45	4	-1.51	17	2.98	5	8.67
Population	36.27	7	1.11	3	-2.30	17	9.00
Natural Disasters & Conflict	11.64	11	0.02	7	1.22	9	9.00
Institutions	13.15	10	-0.64	14	2.33	7	10.33
Financial Sector	24.62	8	-0.48	12	0.42	13	11.00
Business Environment	5.09	15	-1.01	16	3.55	4	11.67
Trade Diversification	13.46	9	-0.64	13	0.13	14	12.00
Financial & Aid Flows	4.99	16	-0.40	11	0.98	10	12.33
Trade Intensity and Composition	5.93	14	-0.19	9	-0.73	15	12.67
Others	2.60	17	0.25	5	-0.91	16	12.67