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AFRICA'S GROWTH MIRACLE

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Africa's Growth Miracles

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Abstract

This study examines the proximate causes of economic growth in Africa's economies since 2000 by combining a growth accounting framework with clustering analysis. We first provide evidence that Africa's growth is unlikely to be an artifact of measurement error, as many countries saw considerable poverty reduction and improvements in other real measures of living standards. We then argue that Africa's growth experiences can be usefully grouped into six distinct clusters that share common growth rates of physical capital per worker, human capital per worker, employment rates, and total-factor productivity. Around half of Africa's countries grew largely from physical capital accumulation, as in the Solow model, with the rest falling into clusters with more distinct proximate causes. The clusters project differently onto changes in commodity prices, rates of conflict, democracy, and foreign assistance, highlighting the diverse roots of Africa's growth miracles.

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1. Introduction

This paper is about Africa's growth miracle, by which we mean the sustained increase in Africa's economic growth rates that started around the turn of the twentieth century. These growth rates, if believed, are indeed worthy of the term "miracle." The average annualized growth rate of GDP per capita in Africa since 2000 has been 5.8 percent, compared to average rates below zero in the previous two decades. A full two-thirds of the world's 1.2 billion Africans live in a country whose average income level has more than doubled since 2000. In recent memory, only China's growth experience since the 1990s can rival Africa's growth miracle for the sheer number of individuals it has brought up from the depths of extreme poverty.

The paper will try to better understand why Africa is growing so rapidly now after decades of stagnation. To do so, we will focus on the following four questions. First, should one believe Africa's growth rates, or are they artifacts of flimsy national account data? Second, what are the proximate factors that account for Africa's growth? Third, how do these factors differ across Africa's diverse economies? And finally, to what extent are favorable terms of trade, better governance, declining conflict, and foreign development assistance correlated with post-2000 growth across African countries? The answers to these questions will help guide whether Africa's growth is likely to continue, slow down in recent years, or be reversed, as would be the case if the growth were largely due to transitory movements in commodity prices.

To answer these questions, we combined multiple publicly available data sources to create a panel of African economies covering 1980 to the present. Our sample comprises all African countries south of the Sahara that have a population of at least two million people. We rely on real GDP, capital stocks, employment, and (schooling) human capital levels from the Penn World Tables to describe the basic patterns of Africa's growth miracle over the past two decades. We extract data on conflicts from two sources, the Armed Conflict Database and Major Episodes of Political Violence (MEPV) as well as the Conflicts Regions Database, to analyze the role of conflicts in Africa's growth. To examine the contribution of Africa's institution quality and political (in)stability we use data from the Polity IV and Coups D'Etat Events. Lastly, we download data from the World Bank on Official Development Assistance (ODA) to explore the role of foreign aid in Africa's development.

Our first task was to provide an answer to the question "should one believe Africa's growth rates?" Household surveys show higher growth rates throughout the African region (see e.g., [Young, 2012](#)), as do night lights data (see e.g., [Pinkovskiy and Sala-i Martin, 2014](#)). However, [Fosu \(2009\)](#) concluded that, on average, poverty reduction is less sensitive to growth in Africa compared to the rest of the developing world. We revisit these facts with a broader array of more recent data

and find strong signs that Africa's fast rates of economic growth are credible. We show that many African nations have seen a dramatic rise in output per capita and at the same time have been able to translate these growths into significant reductions in poverty rates as measured by the share of the population living under \$2.15 a day. We also present data to demonstrate that poverty rates did not just reduce in Africa, but there were widespread improvements in the real standard of living of its citizens. For example, there were notable increases in the percentage of the population living in houses with finished floors, improved sanitation facilities, and access to electricity and water.

We then explored the key drivers of Africa's growth through a growth accounting exercise. Our results show that the growth experiences in Africa were diverse. Although many countries grew mainly through investments in physical capital, others advanced economically by combining inputs more efficiently. For example, rapid TFP growth was a key driver in Angola, the Democratic Republic of the Congo, and Nigeria. Capital accumulation drove growth in Kenya and Mozambique. Some countries, including Malawi and Zimbabwe, did not grow at all, experiencing negative growth in both capital per worker and TFP. Increases in employment per capita, which were generally low across the board, had little effect in most countries, though with exceptions. Growth in human capital per worker contributed modestly, on average, to Africa's growth, though again with significant heterogeneity across countries.

Given how heterogeneous the growth experiences across African economies have been, the next exercise we conducted was to group countries into distinct clusters based on their growth rates of capital per worker, employment per capita, human capital and TFP. This approach, which is novel in the growth accounting literature, draws on clustering analysis and, in particular, Agglomerative Hierarchical Clustering. In this method, each country is initially considered to be its own unique cluster. The number of clusters is then reduced iteratively by merging the two closest clusters according to the Euclidean distance metric. This process continues until all countries fall under a single unique cluster. In practice, we focus on six clusters, which strikes a balance between parsimony and also provides a useful way to describe the distinct growth patterns present across Africa's diverse economies.

According to our clustering results, more than half of the African countries in our sample, in terms of their population share, grew from accumulating capital, albeit in varying degrees. Around a third of the growth of African countries could be explained by improvements in TFP, while the rest did not grow at all. Specifically, for the countries in the first cluster, whose combined population was around a quarter of Africa's total, TFP improvements were the main factor behind their significant growth, with capital accumulation playing a supporting role. The second group, which represents one fifth of Africa's population, grew almost entirely as a result of aggressive capital accumulation. The third cluster had significant TFP growth but saw declines in capital per worker. The fourth

group, which represents more than one third of the continent's population, had balanced growth in the sense that all factors played an important role. The last two clusters saw negative growth in output per capita and TFP, but with differing degrees of capital accumulation.

Next, we projected the clusters onto measures of terms of trade, conflicts, institutional quality, and foreign development assistance to identify possible correlates of the growth patterns for each cluster. We found that rising commodity prices were most significant in the first cluster, suggesting a possible determinant of their robust TFP growth. Conflict fell the most in the second cluster. The increase in democracy was most pronounced in the third cluster, which also saw robust TFP growth. The fourth one, which experienced balanced growth, saw increases in democracy, reductions in conflict, and some favorable movements in the terms of trade. Foreign aid was primarily advanced to conflict-prone countries with low growth to begin with, specifically, countries in the third and fifth clusters. In the sixth cluster, the worsening terms of trade and weak governance over the period seemed to have contributed to their disastrous growth performance.

We are not be first to attempt accounting for Africa's growth. Our paper complements several other studies that study the causes of Africa's growth miracle. [McMillan, Rodrik, and Verduzco-Gallo \(2014\)](#) provide evidence that much of Africa's growth is accounted for by structural change, and in particular movements of workers from agriculture into the non-agricultural sector, which has higher productivity on average than agriculture ([Gollin, Lagakos, and Waugh, 2014](#)). Several other studies have investigated the role of exports ([Ee, 2016](#); [Fosu, 1990](#)) and trade in general ([Zahonogo, 2016](#)) on the growth of African economies and have discovered that the opening of Africa's economies to trade has brought about significant improvements in output per capita across Africa. [Rodrik \(2018\)](#) points out that Africa's growth miracle has also been a period of greater democracy, though he questions whether better democracy by itself explains much of Africa's growth miracle. In particular, [Acemoglu, Naidu, Restrepo, and Robinson \(2019\)](#) estimate that full democratization leads to 20 percent higher GDP per capita, while Africa's GDP per capita grew by more than 100 percent in the 15 years since 2000, and their moves toward better democracy were modest overall.

Additionally, [Fosu \(1992\)](#) provides evidence suggesting that increased political instability around the period 1961-1980 retarded economic growth. Conversely, [Straus \(2012\)](#) documents that the period since 2000 has seen fewer, and much smaller, civil wars than in the 1980s or 1990s. The empirical literature on conflict and growth has found somewhat surprisingly small effects of conflict. Still, the improvements in democracy and fewer conflicts may provide part of the reason *why* African countries made such substantial investments in electricity supply since 2000. While a full accounting of why is beyond the scope of this paper, one can easily imagine a more democratic government is more determined to provide growth-enhancing investments in public goods, and a

country with less conflict will have more resources at its disposal to invest in public goods, such as hydroelectric dams.

The rest of the paper is structured as follows. In the next section, we will explain what we meant by “the African Growth Miracle”. In the section that follows, we will attempt to convince skeptics why they should believe that the growth experienced by African countries post-2000 is no fluke. We will subsequently discuss our data in the next section. Section 5 describes our growth accounting procedure and presents the results while Section ?? presents some possible mechanisms that explain the rapid growth of GDP per capita in Africa. Section 7 concludes the paper.

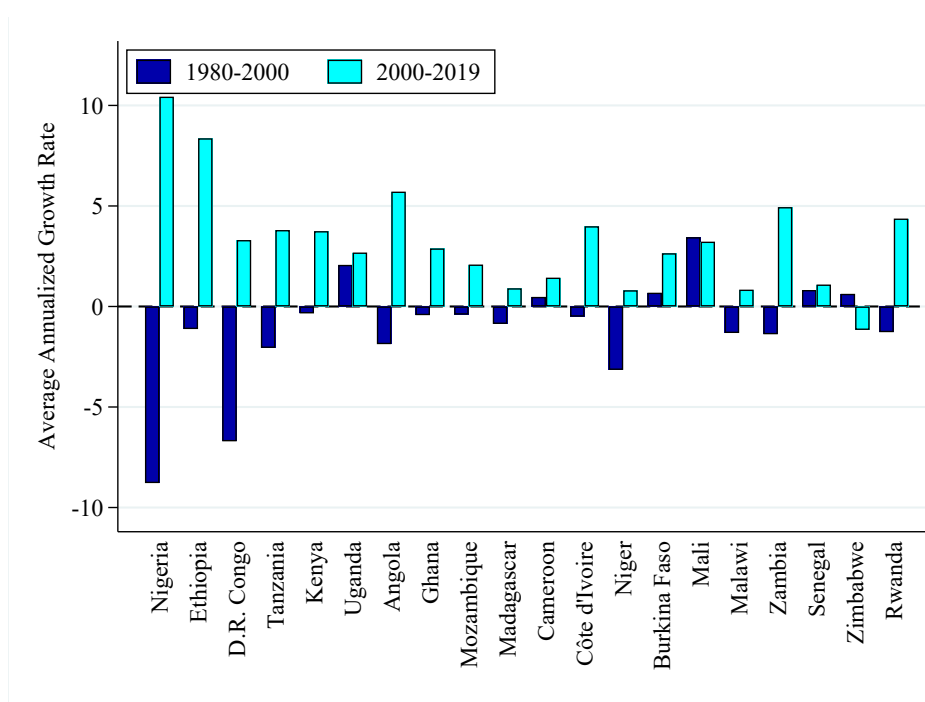
2. What is the African Growth Miracle?

After decades of stagnation, Sub-Saharan Africa began a period of sustained GDP growth in the early 2000s. According to national income aggregates from the Penn World Tables (PWT), annualized GDP per capita growth across African countries averaged over 5 percent from 2000 to 2014, compared to below-zero growth rates from 1980 to 2000. In cumulative terms, GDP per capita more than doubled on average in Africa since 2000, and, according to [Young \(2012\)](#), household surveys imply even faster rates of growth than do the national accounts. Additionally, [Fosu \(2015\)](#) even suggests that this growth process started much earlier, specifically, in the mid-1990. It is no wonder this period has come to be called “Africa’s growth miracle” ([McMillan, Rodrik, and Verduzco-Gallo, 2014](#); [Rodrik, 2018](#); [Young, 2012](#)).

Consequently, we refer to the African Growth Miracle as the growth process that started in 2000. Africa did not experience such a larger 15-year growth period as it did starting in the year 2000 that the weighted African aggregate 15-year growth rate picks in 2000. In fact, the second largest process (1962-1977) did not reach half of the aggregate growth compared to the process started in 2000. More precisely the average annualized growth rate of GDP per capita in Africa from 2000 to 2009 has been 7 percent, compared to an average rate of around zero percent between 1980 to 2000 and 2009 to 2019. In fact, this process can be compared to the largest growth processes experienced around the world.

In [Figure 1](#), we plot a bar chart of the average annualized growth rates of GDP per capita for two periods: from 1980 to 2000 (the dark blue bars) and from 2000 to 2019 (the light blue bars) for the 20 most populous nations in Africa. It will be realized that most of the countries experienced negative or near-zero growth rates before 2000 compared to post-2000, where there were positive growth rates for most of them. The only oddity is Zimbabwe which experienced a slight dip in GDP per capita growth between 2000 and 2019. Nigeria and Ethiopia were the top two performing countries. Nigeria, in particular, rebounded from a negative 9 percent growth rate pre-2000 to a

Figure 1: Growth Rates of GDP per Capita in Sub-Saharan Africa



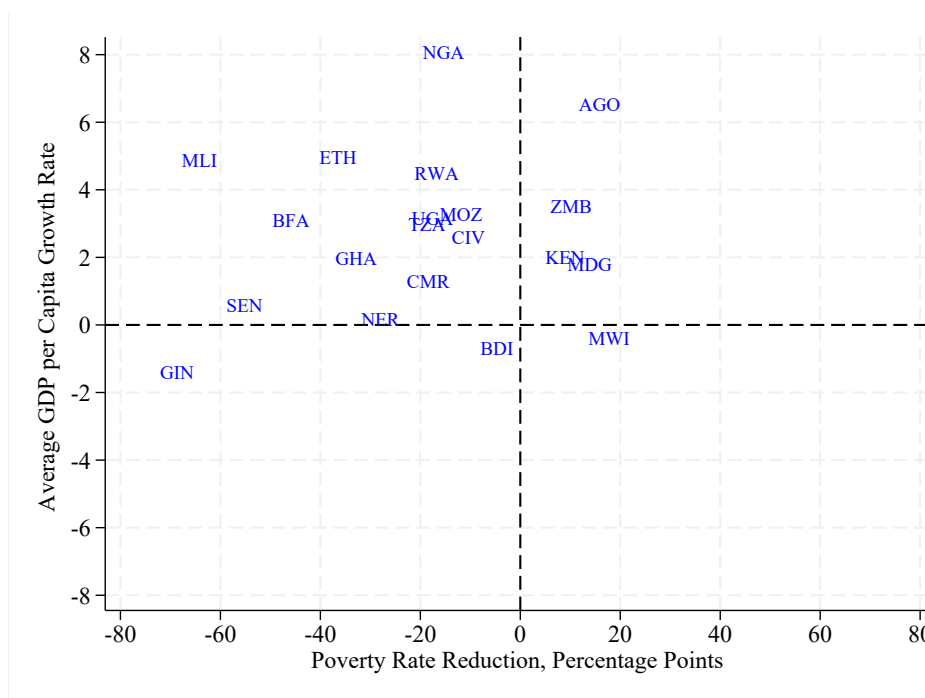
Notes: This figure shows a bar charts of the growth rates of GDP per Capita for the twenty most populated Sub-Saharan African countries, excluding South Africa. Chad was also excluded because of missing human capital data. The analysis covers two periods: 1980-2000 and 2000-2019. Countries are ordered by 2019 population in descending order of magnitude. Data on GDP and population was sourced from the PWT.

more favorable 10 percent growth post-2000. Countries such as Tanzania, Kenya, Angola, Côte d'Ivoire, and Zambia had modest, in percentage points terms, but still significant growth trajectories. Some countries, including Cameroon, Madagascar, Malawi, and Niger grew marginally or stagnated between the two periods.

3. Should one Believe the African Growth Miracle?

Many critics have argued that the economic growth experienced recently by many African countries, though impressive, has been uneven and limited in its impact on improving the standards of living for many of Africa's population. For example, [Jerven \(2015\)](#) has made the case that the growth is concentrated in isolated sectors of the economy especially in extractive sectors such as oil and mineral resources with few spillover effects to the entire economy. Others such as [Young \(2012\)](#), have argued that statistical inaccuracies in estimating national income for many African economies have undermined the reliability of the growth data, complicating accurate analysis of the development phenomenon. Thus, an obvious question to ask is if the African growth process that started at the turn of the century reduced poverty and enhanced the living conditions of its

Figure 2: GDP Per Capita Growth and Poverty Reduction

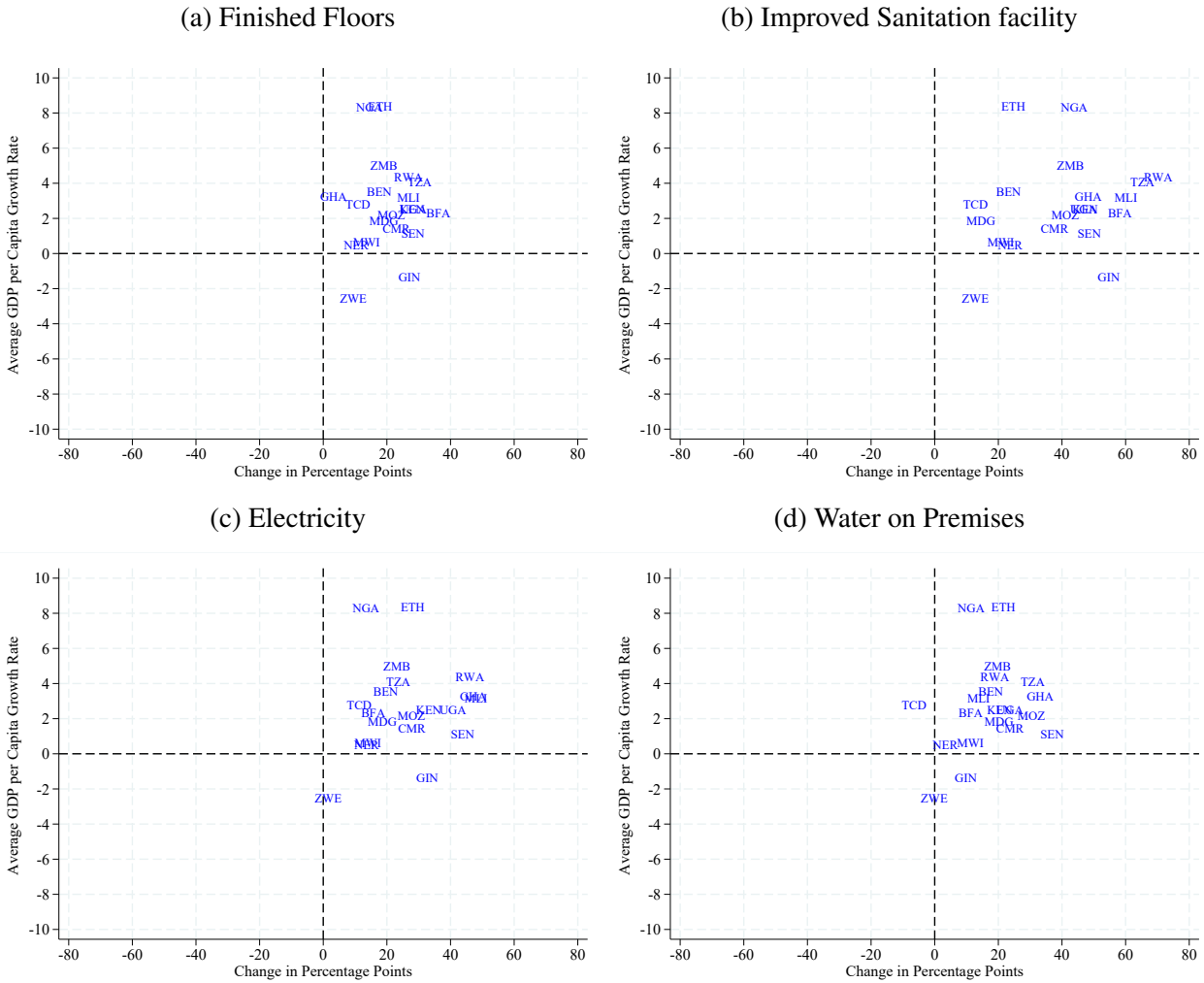


Notes: This figure shows a scatter plot between GDP per capita growth rates and the percentage points reduction of the share of population living under US\$2.15 per day (2017 PPP). The source of the poverty data is the World Bank’s World Development Indicators. The country sample consists of Sub-Saharan countries with available poverty data, excluding South Africa. From these countries, the 20 most populated ones are selected. The countries and their respective analysis periods are as follows: Angola (AGO, 2000-2018), Burkina Faso (BFA, 1994-2018), Burundi (BDI, 1992-2013), Cameroon (CMR, 1996-2014), Côte d’Ivoire (CIV, 1992-2018), Ethiopia (ETH, 1995-2015), Ghana (GHA, 1991-2016), Guinea (GIN, 1991-2018), Kenya (KEN, 1992-2015), Madagascar (MDG, 1993-2019), Malawi (MWI, 1997-2019), Mali (MLI, 1994-2018), Mozambique (MOZ, 1996-2014), Niger (NER, 1992-2018), Nigeria (NGA, 1992-2018), Rwanda (RWA, 2000-2016), Senegal (SEN, 1991-2018), Tanzania (TZA, 1991-2018), Uganda (UGA, 1992-2019), Zambia (ZMB, 1991-2015). GDP per capita was from the PWT.

citizens. We dedicate this section to providing some evidence to answer this question.

We show in Figure 2, a scatter plot of GDP per capita average growth rates and the percentage points reduction of the population living under \$2.15 a day for a set of available Sub-Saharan countries. Given the limited availability of poverty data, the variation in poverty rates was calculated as follows. The closest record to the year 2019 was taken, and the closest record to the year 2000 was also taken, prioritizing observations from the 1990s over those from the 2000s. The reduction is computed as the observation closest to 2019 minus the observation closest to 2000. Note that negative values indicate a reduction in poverty rates while positive values represent an increase in poverty rate. Also, because the periods are not uniform, the annualized growth rates of GDP per capita were recalculated to match the respective periods.

Figure 3: GDP Per Capita Growth and Real Living Standards



Notes: This figure shows a scatter plot of GDP per capita growth rates and the percentage points change in the fraction of households with: Panel (a) - Finished Floors, Panel (b) - Improved Sanitation Facility; Panel (c) - Electricity; and Panel (d) – Water on Premises. The source of living standards data is the Demographic and Health Surveys (DHS). The country sample consists of Sub-Saharan countries with available living standards data, excluding South Africa. The countries and their respective analysis periods are as follows: Benin (BEN, 2001-2018), Burkina Faso (BFA, 1999-2018), Cameroon (CMR, 1998-2018), Chad (TCD, 1997-2015), Ethiopia (ETH, 2000-2019), Ghana (GHA, 1998-2019), Guinea (GIN, 1999-2018), Kenya (KEN, 1998-2015), Madagascar (MDG, 1997-2016), Malawi (MWI, 2000-2017), Mali (MLI, 1996-2018), Mozambique (MOZ, 1997-2018), Niger (NER, 1998-2012), Nigeria (NGA, 2003-2018), Rwanda (RWA, 2000-2019), Senegal (SEN, 1997-2019), Tanzania (TZA, 1999-2017), Uganda (UGA, 1995-2019), Zambia (ZMB, 1996-2018), Zimbabwe (ZWE, 1999-2015). GDP per capita data was taken from the PWT.

Additionally, in Figure 3, we show scatter plots of GDP per capita growth rates and percentage changes in four commonly used living standard measures. For each of the plot, we plot the GDP per capita growth rate on the vertical axis and the percentage point change in the share of the population

with: finished floors (Panel A), improved sanitation facilities (Panel B), access to electricity (Panel C), and water on-premises (Panel D) on the horizontal axes. Again, due to the limited availability of living standards data, the variations were estimated using a similar approach as we used in calculating the poverty rates. That is, the closest record to the year 2019 and the closest record to the year 2000 were taken, prioritizing observations from the 1990s over those from the 2000s. The improvement is computed as the observation closest to 2019 minus the observation closest to 2000. Note that positive values mean more people have improved standards of living while the reverse is true for negative values. Also, because the periods are not uniform, the annualized growth rates of GDP per capita were recalculated to match the respective periods.

From our analysis, it is conclusive that many African countries that had positive growth rates also enjoyed a reduction in poverty rates and an improvement in standards of living. From Figure 2, it could be seen that many of the countries were located in the top-left quadrant. This indicates that this set of countries experienced positive growth as well as a reduction in poverty rates albeit with few exceptional cases. For example, Senegal and Niger barely grew but were able to reduce the poverty rate by close to 60 and 30 percentage points respectively. Also, a few of the countries located in the top-right quadrant grew but had poverty rate increases of not more than 20 percentage points. Similarly, Malawi located in the bottom right, had near-zero growth rates as well as an increased share of the population living under \$2.15 daily. Lastly, Burundi and Guinea which are located in the bottom-left quadrant, despite having negative growth rates, achieved mixed success in reducing population living under \$2.15 a day. Whereas Guinea significantly reduced poverty by nearly 70 percent, Burundi barely did that.

Regarding living standards, the majority of the African countries in our data were located in the top-right quadrant as indicated in Figure 3. This suggests that many African countries were able to transform the increased growth in output per capita into higher living standards of their population. However, this was not always the case for certain countries. A particular case is Nigeria which grew by almost 8 percent but did not correspond to an important decrease in poverty rates¹. Also, there was less than a 20 percentage point increase in the proportion of the population that had finished floors, electricity access, and water on premises. In contrast, there was a more than 40 percentage point increase in the proportion of the population which had improved sanitation facilities. Kenya on the other hand as the rest has a sharp improvement in the development variables although there was an increase in the poverty rate in the first years of 2000. Nonetheless, as there is no data after 2005, we cannot conclude that this process continued.

From the forgone analysis, while it is true that the growth in output per capita did not lead to a significant reduction in poverty and improvement in the living standards for a few of the countries

¹Poverty rates reduced by just under 20 percentage points

in our sample, it did for many African countries. Even still, few countries had poverty rate reduction despite economic challenges highlighting that even with little or no economic growth, poverty reduction is still possible given the right policy framework.

4. Data Description

We start by doing the growth accounting for the African growth miracle and comparing this growth process with the largest growth episodes of the Asian countries. For this, we use the Penn World Table for data on real GDP, capital, employment, population, and human capital index. We are interested in a particular set of African countries. Therefore, we first restrict the sample to African countries and we drop all countries with less than 2 million people in 2014². Moreover, we drop the North African countries Libya, Algeria, Morocco, Egypt, Tunisia and Mauritania.

We then proceed to study the African context and possible drivers of this growth miracle by analyzing the degree of conflict and how this changed over these periods. To analyze conflict and its relationship with the growth experience in Africa we use two sources. First, we use the Armed Conflict Database from the joint work by the Uppsala Conflict Data Program (UCDP) and the Peace Research Institute of Oslo (PRIO) in which there is data on civil and international war episodes involving each country. Second, we use the Major Episode of Political Violence (MEPV) and Conflict Regions database (taken from the Center for Systemic Peace, CSP) which contains yearly measures of major episodes of political violence.

To address the African institutional context, in terms of political stability and institutions' quality and how these have changed in the last 15 years we use two sources of data. We start by using the Polity IV project in which data on authority characteristics of states are coded to reflect political regime characteristics. From this source, we use two measures that are the ones used to code the PolityIV variable which are the democracy measure and the Autocracy measure. Furthermore, we use a second source on institutional quality which is the Coups D'Etat Events (taken from the Center for Systemic Peace, CSP) which provides information on successful coups D'Etat, attempts of coups, alleged coups reported by the government, auto-coups, ouster of leadership by foreign and rebel forces and assassinations as well as resignation of executive due to poor performance. From this last source, we can construct an "instability" measure and see how this measure changed over these periods.

²We drop all countries with less than around 2 million people which, in the PWT, are: Equatorial Guinea, Guinea-Bissau, Seychelles, Comoros, Reunion, Gabon, Djibouti, Swaziland, Mauritius, Cabo Verde, Sao Tome and Principe

5. Growth Accounting

In this section, we do the growth accounting for the African growth miracle. Following the literature on development and growth accounting (e.g., Caselli, 2005; Hsieh and Klenow, 2010) we posit a Cobb-Douglas aggregate production function with a common labor share across countries (Gollin, 2002). Note that the production function can be rewritten as:

$$y_t = A_t k_t^\alpha h_t^{(1-\alpha)} l_t$$

Where y_t is GDP per capita, k_t is capital per worker, l_t is the employment/population ratio and h_t is the aggregate human capital index. Moreover, it can be shown that the production function can be rewritten in growth rates. In growth rates, the production function (in logs) is:

$$g_t^y = g_t^A + \alpha g_t^k + (1 - \alpha) g_t^h + g_t^l$$

The Solow residual was then calculated as:

$$A_t = y_t / (k_t^\alpha h_t^{1-\alpha} n_t)$$

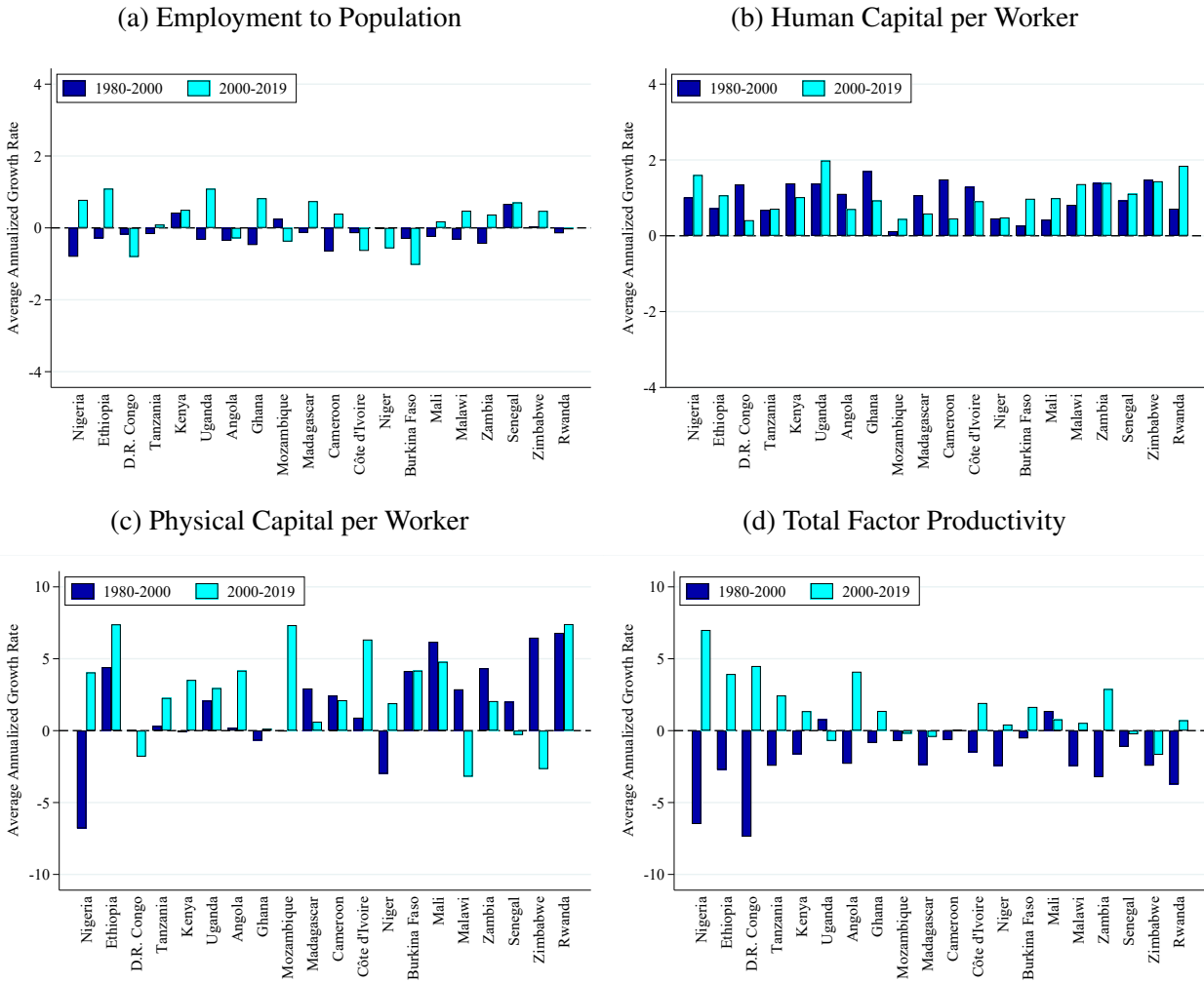
Where y is output per capita, k is capital per worker, h is the human capital index, and n is workers per capita.

5.1. Growth Accounting Results

In this section, we discuss our growth accounting results. Figure 4 displays the average annualized growth rates of sources of growth, i.e., employment-population, human capital per worker, physical capital per worker, and TFP for the period 1980-2000 and 2000 to 2019 for the twenty most populous economies in SSA. Moreover, in Appendix Table B3 to Table B7 we show the average annualized growth rates of sources of growth for the two periods for all countries in our sample. In Table 1, we show how much each category explains the GDP per capita growth rate for the period 2000-2019. For brevity, we report the results for just the top twenty most populous economies while Appendix Table B8 reports for the entire sample of countries in our data.

Our growth accounting results suggest that economic development across African countries between 2000 and 2019 has been diverse, with no common explanation. That is, whereas some grew solely through the accumulation of capital, others advanced mostly through TFP improvements as shown in Table 1. For example, countries that grew mainly from TFP were Ghana, Nigeria, Tanzania, D.R. Congo, and Angola emphasizing efficiency gains and TFP in these countries. On

Figure 4: Growth Rates of Growth Sources



Notes: This figure plots bar charts of the annualized growth rates of sources of growth (i.e., employment to population ratios, human and physical capital per work, and TFP) for the twenty most populated SSA countries, excluding South Africa. Chad was also excluded because of missing human capital data. The analysis covered two periods: 1980-2000 and 2000-2019. Countries are ordered by 2019 population in descending order. Data collected from the PWT.

the other hand, countries such as Kenya and Uganda expanded their economies primarily through capital accumulation highlighting the significant investment in infrastructure expansion. However, human capital and employment-to-population ratios contributed little to nothing to Africa’s economic expansion underscoring their limited impact.

Employment-to-population ratios and human capital per worker explain little of Africa’s growth. As shown in Table 1, just a tenth of Africa’s growth in GDP per capita can be traced to increases in its employment-to-population ratios. This is a different pattern from the East Asian growth miracles, where sustained increases in employment rates were a significant proximate cause of

Table 1: Share of GDP per Capita Growth Explained by Each Category Average Growth Rate between 2000-2019 for Top Twenty Most Populous African Countries

Country	Output per Capita Growth	Capital per Worker	Employment/Population	Human Capital	TFP
Nigeria	10.4	19	7	8	63
Ethiopia	8.4	43	13	7	36
D.R. Congo	3.3	-27	-24	6	147
Tanzania	3.8	29	2	10	58
Kenya	3.7	46	13	14	26
Uganda	2.7	53	41	38	-32
Angola	5.7	35	-5	6	62
Ghana	2.9	2	29	17	52
Mozambique	2.1	170	-18	11	-58
Madagascar	0.9	33	82	33	-49
Cameroon	1.4	71	28	16	-15
Côte d'Ivoire	4.0	77	-16	12	28
Niger	0.8	115	-71	31	26
Burkina Faso	2.6	76	-39	19	44
Mali	3.2	72	6	16	7
Malawi	0.8	-185	57	84	148
Zambia	4.9	20	8	15	57
Senegal	1.1	-13	65	52	-4
Zimbabwe	-1.2	111	-41	-64	91
Rwanda	4.4	82	-1	22	-2

Notes: This table shows annualized growth rates of GDP per capita and a decomposition into the contribution of capital per worker, employment/population, human capital, and total factor productivity during the 2000-2019 period ranked by the top twenty most populous nations in Africa. The shares are average percent explained and therefore would not sum up to 100 percent. Refer to Appendix Table B8 for the results for the entire sample of countries in our data. Data was taken from the PWT.

growth (Young, 1994). The differences lie not in hours worked, which are similar in Africa and Asia (see Table B1 in Appendix B), but in fertility rates, which have not fallen as fast in Africa as they did in East Asia (see Figure C12 in Appendix C).

Moreover, the contribution of human capital per worker to Africa's growth is quite negligible. We find that increases in human capital per worker – at least proxied by schooling years – are not a significant driver of Africa's growth miracle in an accounting sense. Increases in average years of school exhibit modest growth over this period and have no significant changes pre- and post-2000. Years of schooling have been increasing, albeit at a slower rate compared to Asia (refer to

Figure C13 in Appendix C). At any level of labor share in our Cobb-Douglas aggregate production function, we have found human capital to explain less than a fifth of Africa’s growth.

5.2. Clustering Africa’s Growth

Following the initial growth accounting results where we found a wide range of growth experiences across Africa, the next exercise we conducted was to cluster the countries, which is novel in the growth accounting literature. This exercise is mainly aimed at identifying countries with similar growth patterns. The clustering procedure we adopted was the *Agglomerative Hierarchical Clustering* procedure. This procedure was used by Humphries (2017) to explore the causes and consequences of self-employment over the life cycle and Audoly, McGee, Ocampo-Diaz, and Paz-Pardo (2024) to investigate wealth mobility over the lifetime of individuals. This clustering procedure starts by treating each of the N countries in our data as its unique cluster, with each country regarded as a unique “snowflake”. It then uses an iterative process to progressively decrease the number of clusters by merging two countries with a common growth pattern into one cluster, then proceeds to the next closest pair. The process continues until all countries in the dataset fall into a single unique cluster.

Table 2: Countries in Each Cluster

Cluster	Countries	Share in Africa’s Population (%)
1	Angola, Nigeria	23.1
2	Congo, Côte d’Ivoire, Ethiopia, Mozambique, Rwanda	18.1
3	D.R. of the Congo, Sierra Leone	9.4
4	Benin, Burkina Faso, Burundi, Cameroon, Ghana, Kenya, Liberia, Madagascar, Mali, Niger, Senegal, Tanzania, Togo, Uganda, Zambia	36.7
5	Central African Republic	0.5
6	Malawi, Zimbabwe	3.3

Notes: This table reports countries in our sample that fall into each cluster after our clustering exercise and their share in Africa’s population. Data on population was for 2019 and was taken from the PWT.

We opt for the complete linkage clustering approach which calculates the distance between two countries as the farthest distance between any single data point in the first cluster and any single data point in the second cluster, respectively. Thus, by definition of cluster distance, at each step of the clustering process, we merge the clusters with the shortest complete linkage distance. Theoretically, we can report the results of the clustering exercise for as many as the number of countries

Table 3: Average Growth Rates of GDP per Capita, Capital per Worker, Employment/Population, and TFP Between 2000 and 2019 for each Cluster

Cluster	Output per Capita Growth	Capital per Worker	Employment/Population	Human Capital	TFP
1	8.1	4.1	0.2	1.2	5.6
2	4.3	7.2	0.1	0.9	1.2
3	3.3	-2.1	-0.5	0.7	4.1
4	2.4	2.1	0.3	0.9	0.8
5	-0.4	5.3	-0.1	0.6	-2.5
6	-0.2	-2.9	0.5	1.4	-0.6

Notes: This table shows the annualized growth rate of GDP per capita and the sources of growth, i.e., capital per worker, employment-to-population ratio, human capital, and TFP for all six clusters.

in our data but that will defeat the purpose of this exercise. This is because we have already reported the growth accounting results for the entire sample of countries from Tables B3 to Table B8. Instead, we settled on six clusters which is reasonable and comparable to the four and seven used in Audoly, McGee, Ocampo-Diaz, and Paz-Pardo (2024) and Humphries (2017), respectively. We clustered the countries using information on their average growth rates of physical and human capital, employment-population ratios, and TFP between 2000 and 2019. Our clustering results are shown in Tables 3 and 4, where we report the average growth rates of GDP per capita and its sources as well as how much of the growth in GDP per capita is explained by each source of growth, respectively. We showed the results for just the 2000-2019 period.

Our clustering procedure grouped the countries into six distinct clusters and identified common growth patterns among the country groups. The first cluster included countries such as Angola and Nigeria, leading crude oil exporters in SSA. Together, countries in Cluster 1 represented under a quarter (23 percent) of Africa’s population. The second cluster countries are Congo, Côte d’Ivoire, Ethiopia, Mozambique, and Rwanda, making up 18 percent of Africa’s population. The third cluster, whose share of Africa’s population was nearly a tenth, consisted of the D.R. of the Congo and Sierra Leone. The fourth cluster is the largest group, both in terms of number of countries and population share. Cluster 4 which consists of 15 countries – Benin, Burkina Faso, Burundi, Cameroon, Ghana, Kenya, Liberia, Madagascar, Mali, Niger, Senegal, Tanzania, Togo, Uganda, and Zambia – accounted for close to two-fifths (38 percent) of Africa’s population. The fifth cluster is made up of only one country, that is, the Central African Republic which population share was only 0.5 percent. The sixth cluster includes Malawi and Zimbabwe whose population share was just 3 percent.

Table 4: Share of GDP per Capita Growth Rates Explained by each Category Average Rate of Growth between 2000 and 2009 for each Cluster

Cluster	Output per Capita Growth	Capital per Worker	Employment/Population	Human Capital	TFP
1	8.1	27	1	7	69
2	4.3	99	0	11	18
3	3.3	-31	-16	11	124
4	2.4	42	19	27	17
5	-0.4	-572	17	-68	584
6	-0.2	-37	8	11	104

Notes: This table shows the annualized growth rate of GDP per capita for all six clusters and how each source of growth (i.e., capital per worker, employment-to-population ratio, human capital, and TFP) contributes to the growth of GDP per capita. The shares are average percent explained and therefore would not sum up to 100 percent.

Based on our clustering results, 23 percent of Africa’s population grew from fast TFP gains and capital accumulation. Furthermore, more than half of the Africa’s population grew primarily through capital accumulation with minimal contribution from TFP, albeit to differing degrees. Moreover, TFP increases solely accounted for growth in under a tenth of the countries we studied, while in the rest of the countries, growth slowed during the period of analysis. In detail, massive TFP growth and capital accumulation were a key driver of the 8 percent growth in GDP per capita observed in Cluster 1. However, TFP’s contribution was twice more than physical capital. The second set of countries, Cluster 2, grew by 4 percent which was half of the growth witnessed in Cluster 1. The growth in GDP per capita for Cluster 2 countries could be attributed to the aggressive capital accumulation with a minimal contribution from TFP. Physical capital’s contribution to growth in GDP per capita for this group was nearly 100 percent while just under a fifth of its growth came from TFP increases. The sluggish growth of TFP may have slowed the growth in GDP per capita for Cluster 2.

Despite the decline in capital accumulation over the period, increases in TFP accounted for the growth in output per capita for Cluster 3 countries. The fourth group of countries, Cluster 4, had a more balanced growth, experiencing positive growth in all sources with varying contributions. Just like Cluster 2, most of Cluster 4’s growth came from the accumulation capital, but was less pronounced. To be precise, the contribution of capital per worker accounted for 42 percent of their growth, followed by human capital (27 percent), next is employment per capita (19 percent), and TFP (17 percent). The fifth group experienced massive capital accumulation. However, the growth in physical capital did not translate into growth in GDP per capita due to the negative TFP growth. This was the complete opposite of what happened with the third group of countries. This time, the

negative effects of TFP could not neutralize the positive growth in capital per worker to stimulate growth in output per capita. The Last group could be classified as a growth disaster as countries did not grow at all, experiencing negative growths in both capital per worker and TFP.

Thus, we conclude from our growth accounting exercise that most of Africa's growth can be attributed to mostly capital accumulation and TFP growth, with heterogeneity across countries. Overall, capital accounted for growth in more than half of the countries we studied while TFP's contributed to the growth of just one-third of the countries. However, whether a country grew through TFP or physical capital is dependent on which cluster the country belonged to. On the other hand, human capital and employment-to-population ratios have contributed little to Africa's growth regardless of which cluster the country belonged to.

6. Correlates of Cluster Growth Experiences

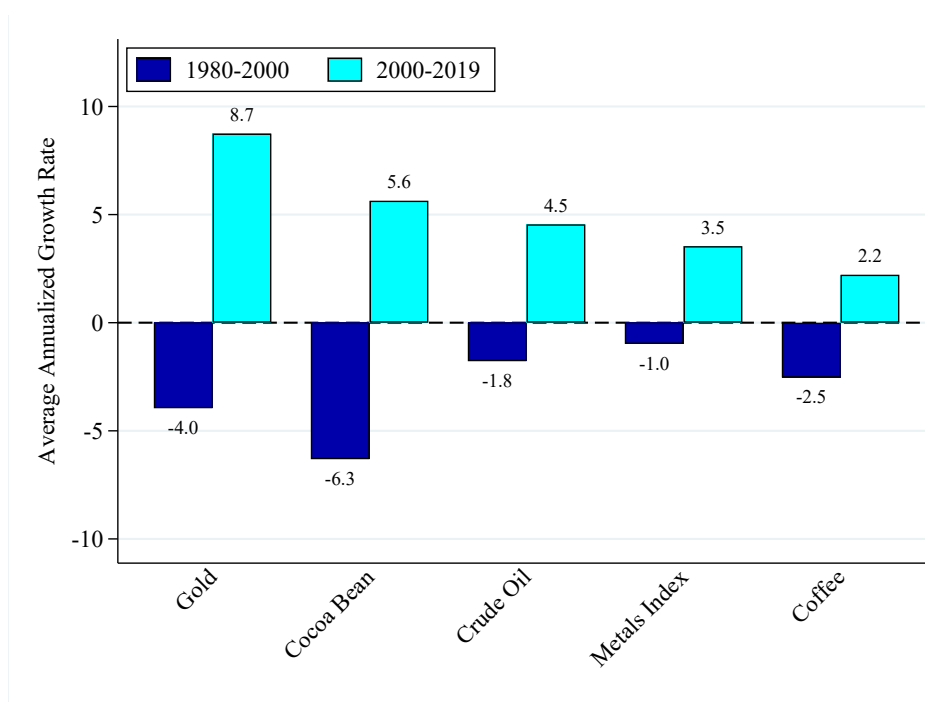
Our discussions have largely centered on examining Africa's growth from a growth accounting perspective by comparing two periods: 1980 to 2000 and 2000 to 2009. Our findings have shown that African countries have had diverse growth experiences, with no single explanation. Many of the countries studied grew by accumulating capital while others have done so through TFP growth. Yet, a few of the countries did not grow at all, experiencing negative growths in both capital per worker and TFP. However, what has accounted for this growth miracle? Is it due to the rise in commodity prices? Or a shift from autocracies to democracies in Africa? Or increases in foreign aid advanced to African countries.

Hence, in this section, we provide possible explanations for the "African Growth Miracles", focusing mainly on terms of trade, governance, institutions, and foreign development assistance. We will begin by looking at how movement in the prices of primary exportable commodities contributed to Africa's growth. We will then proceed to present evidence on how reducing conflicts and the growth of democratic institutions have positively impacted Africa's growth. Finally, we will examine the role of foreign aid in Africa's economic progress.

6.1. Terms of Trade Shock

Some authors have argued that the growth in Africa post-2000 can be largely attributed to favorable commodity prices (Deaton, 1999; Mold and Prizzon, 2015). Several other papers have established a positive correlation between exports (Ee, 2016; Fosu, 1990) and trade (Zahonogo, 2016) on economic growth in SSA. Moreover, in our growth accounting exercise, we identified TFP to account for growth in one-third of Africa nations we studied. Theoretically, improvements in commodity prices and terms of trade will likely lead to more trade liberalization policies. The

Figure 5: Growth Rates of Commodity Prices

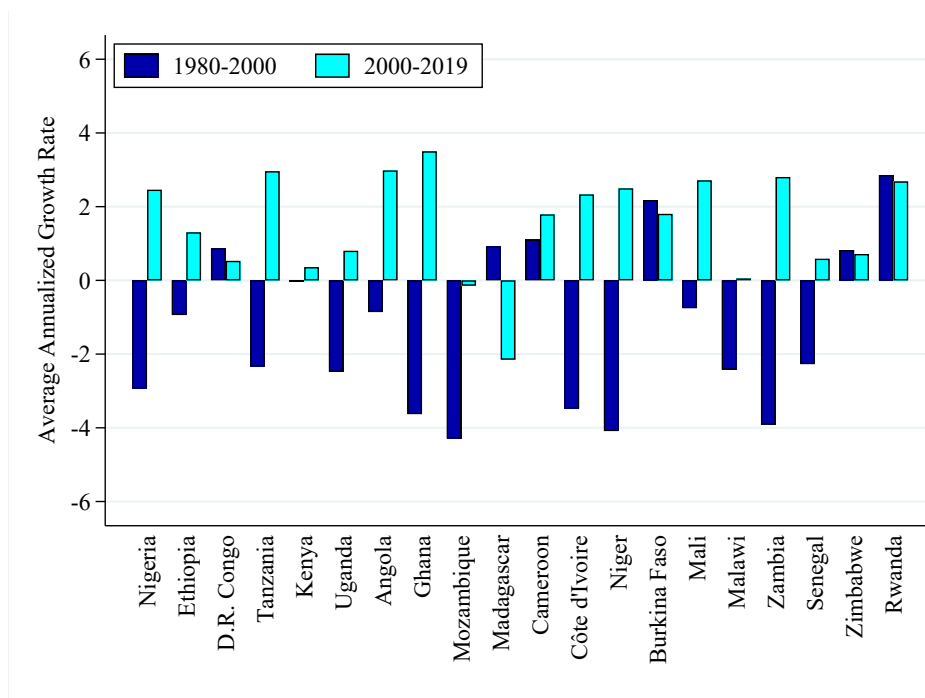


Notes: This figure shows a bar chart of the growth rates of prices of five selected commodities, i.e., gold, cocoa beans, crude oil, metal, and coffee. Gold price data comes from the Deutsche Bundesbank and it's the monthly average of the gold price in London. The rest of the data comes from the World Bank and in monthly prices, except metals, which is a monthly index. Metals refer to metals & minerals and coffee to Arabica coffee.

opening up of the economy to the international markets induces the adoption of efficient technologies and efficiency-driven productive activities. Therefore, could it be that the gains in TFP were largely due to rise in commodity prices and more favorable terms of trade? We examine these issues critically in this section.

In Figure 5, we plots a bar graph of the average annualized growth rate of prices for five major commodity exports – gold, cocoa beans, crude oil, metals, and coffee – from SSA countries. As we have been doing in our analysis, we plot this for two periods: from 1980 to 2000 and from 2000 to 2019. Similarly, In Figure 6, we plot a bar chart of the average annualized growth rates of net barter terms of trade for the 20 most populous countries in Africa for the same periods as in Figure 5. Net barter terms of trade, as defined by the World Bank, is the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. For both figures, the dark blue bars represent the average annualized growth rate for the period 1980 to 2000 while the light blue bars correspond to the period 2000 to 2019. Lastly, we show a time series plot of normalized terms of trade for the six clusters created in our clustering exercise for the period 2000 to 2019 in Figure 7.

Figure 6: Growth Rates of Terms of Trade in Sub-Saharan Africa

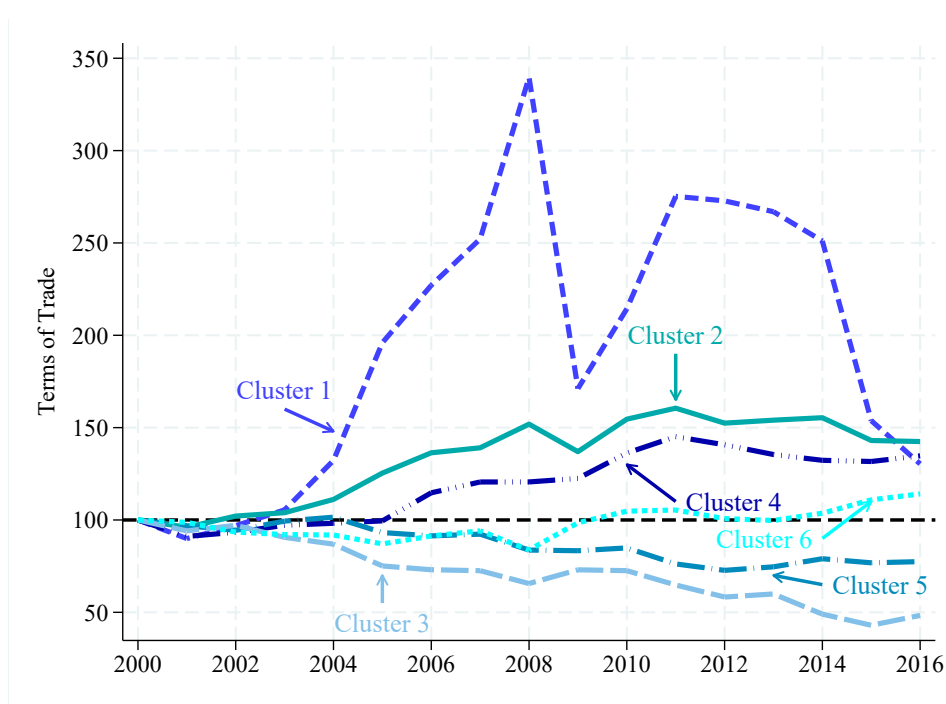


Notes: This figure shows a bar chart of the growth rates of Terms of Trade for the twenty most populated Sub-Saharan African countries, excluding South Africa. The analysis covered two periods: 1980-2000 (in dark blue bars) and 2000-2019 (in light blue bars). Countries are ordered by 2019 population in descending order of magnitude. Net barter terms of trade index (2000 = 100) was from the World Bank.

Commodity prices generally trended downwards between the period 1980 and 2000 but rebounded after the year 2000 albeit with few variations as shown in Figure 5. Commodities such as gold and cocoa beans experienced the greatest jump post-2000 while the growth rate of crude oil prices and metals (i.e., aluminum and copper) had relatively modest increases in their prices. Comparatively, coffee had the least price increase after 2000. The massive surge in commodity prices during the period 2000 to 2019 translated into improved terms of trade for many SSA countries for the same period as shown in Figure 6. For example, leading oil exporters such as Nigeria and Angola improved their terms of trade massively due to rising crude oil prices post-2000 compared to the period before that. Similarly, well-known cocoa exporters like Ghana and Côte d’Ivoire also witnessed positive growth in their terms of trade because of the upward movement of cocoa bean prices. Moreover, due to the modest rise in coffee prices, Ethiopia and Kenya did not improve their terms of trade that much. Conversely, countries such as Madagascar, Malawi, and Mozambique experienced negative terms of trade due to their low-value primary commodities and lack of export diversification.

In the last paragraph, we demonstrated that the increase in the prices of key commodities led to an

Figure 7: Terms of Trade from 2000 to 2009 for Six Clusters



Note: This figure plots the time series of terms of trade for the six clusters during the period 1990-2020. Data on terms of trade was collected from the United Nations Conference on Trade and Development, Handbook of Statistics and data files, and International Monetary Fund, International Financial Statistics, both compiled from the Databank repository of the World Bank.

improvement in terms of trade in many of the SSA countries. Thus, we established a positive correlation between commodity prices and terms of trade. In the ensuing paragraphs, we will examine which clusters benefited the most from the commodity price boom and the resulted favorable terms of trade. Figure 7 shows that Cluster 1 improved their terms of trade the most over the period 2000 and 2019, though there were some volatility. Interestingly, the two countries that are in Cluster 1 include Nigeria and Angola (see Table 2), who are massive oil exporters. As clustering results shows, countries in the first cluster grew mostly from TFP. Similarly, countries in Clusters 2 and 4 that grew marginally from TFP also had modest improvement in their terms of trade. Clusters 5 and 6 which had negative TFP growth also had worsening terms of trade over the period. Conversely, Cluster 3 which grew solely from TFP had worsening terms of trade throughout the period, although countries in this cluster can be described as leading exporters of precious minerals, especially D.R. of the Congo. This may imply other factors might have contributed to their TFP growth other than commodity prices. Therefore, our findings from this section suggests a positive correlation between terms of trade and TFP in SSA.

6.2. Conflicts and Institutions

To explain differences in income (and growth) across countries many studies have focused on institutions and property rights, concluding that countries with stronger property rights and more transparent governments tend to have better economic performance (Acemoglu, Johnson, and Robinson, 2001; Rodrik, 1999). Moreover, a larger degree of conflicts, such as civil (or international) wars or political instability, tends to depress private investment and, at the same time, a country with fewer conflicts will have more resources at its disposal to invest in public goods and governments more determined to provide growth-enhancing investments.

One important driver of the growth miracle was capital accumulation as it was shown in the accounting exercise. Capital per worker in Africa is the component of GDP that explains most of the large increase in GDP per capita over the last two decades, particularly for countries in Clusters 2 and 4. Therefore, it is very likely that the improvement in the degree of conflict, political stability, and governance over the 2000s explains part of the high capital accumulation that boosts output per capita in Africa. Therefore, in this section, we use different measures of conflicts, political instability, governance, and institutions' quality to analyze how the African context changed focusing on the difference between the pre and post-2000 periods.

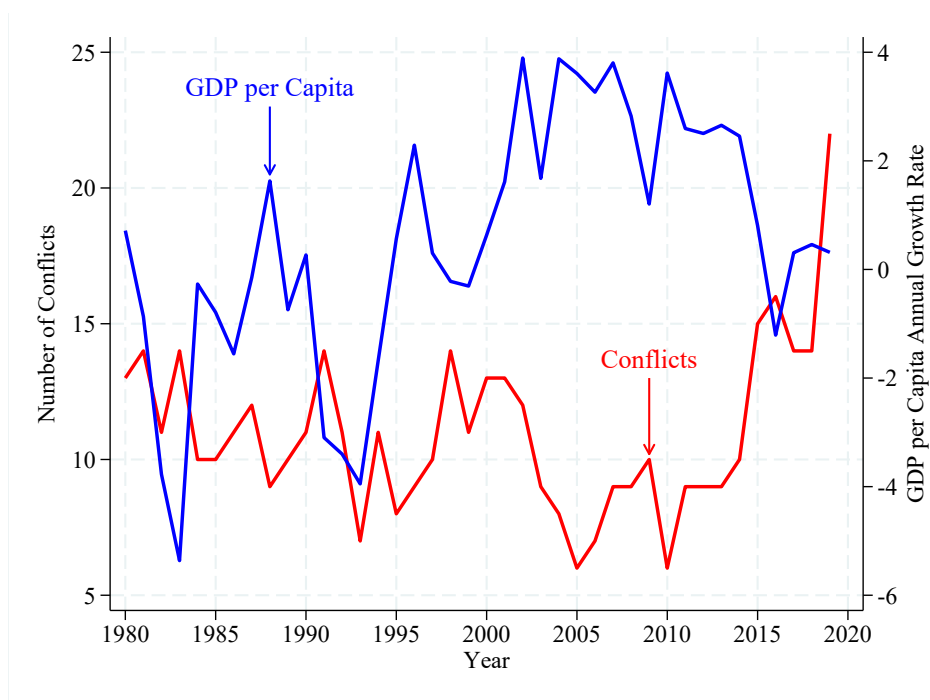
6.2.1. Conflicts

In order to analyze conflict and its relationship with the growth experience in Africa we use the Armed Conflict Database from the joint work by the Uppsala Conflict Data Program (UCDP) and the Peace Research Institute of Oslo (PRIO). Straus (2012) was the first to use this data to describe African conflicts and to analyze the character of warfare in this region, showing that conflicts, and mass killings, in Africa, had decreased substantially in the past 30 years (in the late 2000s conflicts were about half as common compared to the mid-1990s), and that conflicts in the 2000s decreased in scale compared to previous years.

This data source defines conflict as “a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths”. This data contains different types of conflicts (e.g. internal wars, internationalized internal war, among others) but for our purpose, we merge conflicts into a single variable as we care about countries having conflicts that prevent necessary investments from taking place and therefore generating lower growth.

Figure 8 plots the time series of GDP per capita growth rate (on the right scale) and number of conflicts (on the left scale) from 1980 to 2020. From the figure, it could be realized that the growth rate of output per capita after 2000 coincided with a reduction in the number of conflicts. When

Figure 8: Number of Conflicts and GDP per Capita Growth Rate

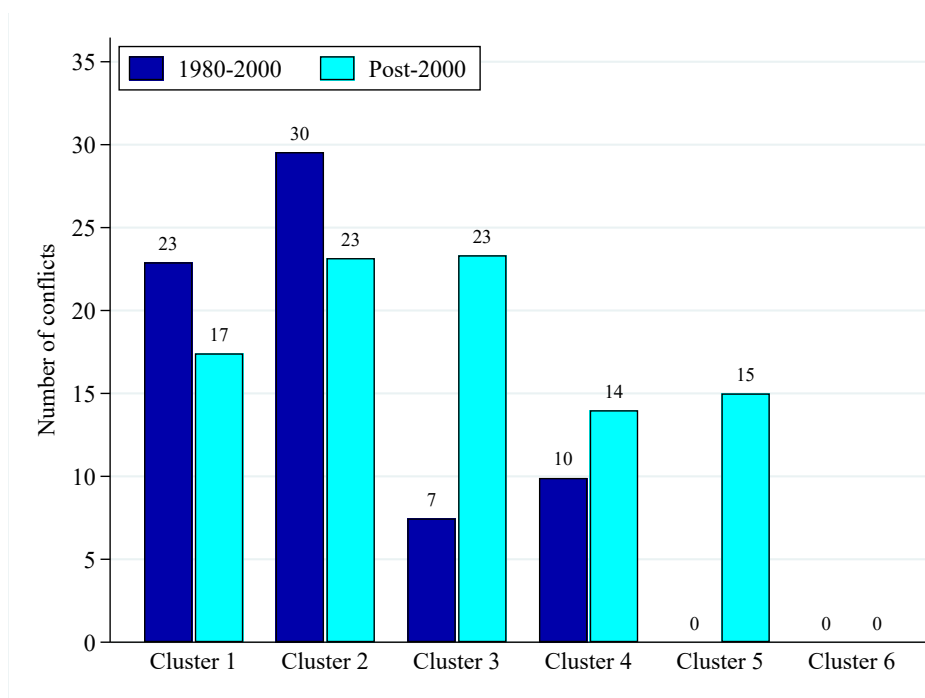


Notes: This figure shows the number of conflicts per year in African countries (measured by the left axis) and the annual growth rate of GDP per capita (measured by the right axis). Conflict data from the Armed Conflict Database from the joint work by the Uppsala Conflict Data Program (UCDP) and the Peace Research Institute of Oslo (PRIO). Data of output extracted from the IMF. Data on population from the PWT.

conflicts began rising again after 2010, the GDP per capita growth rate also started declining. This suggests a strong negative correlation between the GDP per capita growth rate and the number of conflicts.

Additionally, when we projected the conflict data on the clusters we created, countries in cluster 1, which grew from capital accumulation, saw a reduction in the number of conflicts from 23 during the period 1980-2000 to 17 between 2000 and 2019 as revealed in Figure 9. In addition, countries in cluster 2, which were characterized by massive growth in capital per worker also witnessed a drop in number of conflicts from 30 in the 1980-2000 period to 23 during the period 2000 to 2019. Cluster 3 countries that grew mostly from TFP, recorded a threefold increase in conflicts from 7 in 1980-2000 to 23 during the period 2000-2019. Despite Cluster 4 also growing through capital accumulation, there was a slight increase in the number of conflicts. However, the total number of conflicts recorded over the two periods (i.e., 1980-2000 and 2000-2019) by this cluster was twice as few as those observed by the first two clusters. Still on the clustering results, countries in Cluster 5 which did not experience overall growth but saw capital per worker rise, went from having zero conflicts in the 1980 to 2000 period to recording 15 conflicts between 2000 and 2019.

Figure 9: Number of Conflicts between the Period 1980 and 2000 vs. 2000 and 2019 for Each Cluster



Notes: This figure shows the number of conflicts for two periods, from 1980 to 2000 and from 2000 to 2019, for the six clusters. Conflict data from the Armed Conflict Database from the joint work by the Uppsala Conflict Data Program (UCDP) and the Peace Research Institute of Oslo (PRIO).

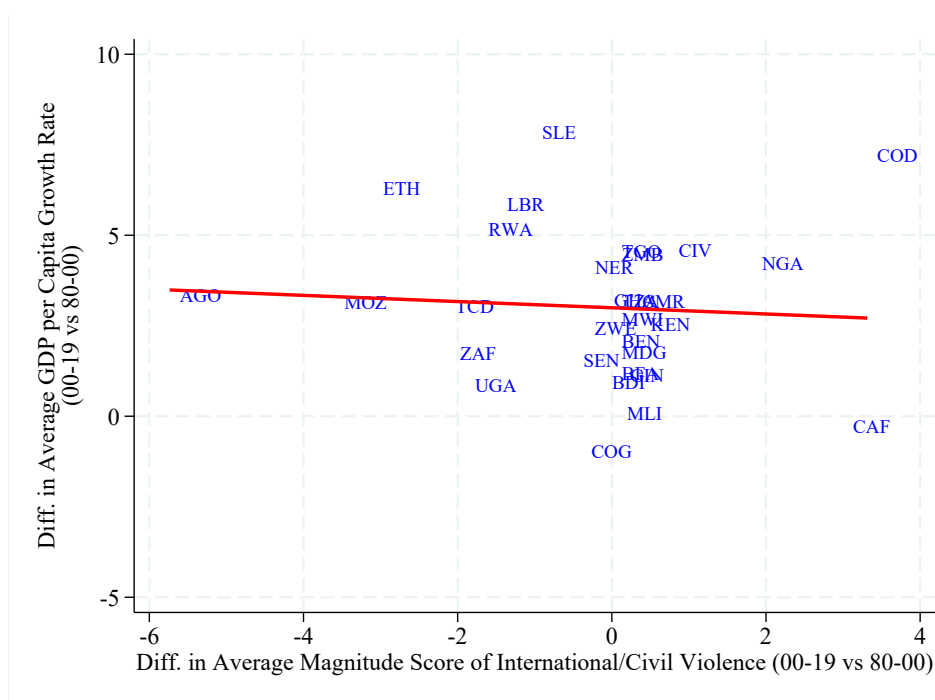
Thus, we can not attribute the growth in capital per worker in this cluster to reduced conflicts. The last cluster, which grew from neither capital accumulation nor TFP, recorded zero conflicts in both periods.

6.2.2. Conflict magnitude scores MEPV

After analyzing the warfare context in Africa, we proceed to analyze another dimension of conflict which is political violence³. We used data from the Major Episode of Political Violence (MEPV) and Conflict Regions database which was taken from the Center for Systemic Peace (CSP). This data contains different yearly measures of “major episodes of political violence that are defined by the systematic and sustained use of lethal violence by organized groups that result in at least 500 directly related deaths throughout the episode”. For each year and country, the database provides a measure between 0 and 10 representing the magnitude of violence for different categories of political violence that goes from international or civil wars to ethnic violence. We use 2 measures to analyze the African context:(1) the magnitude of all interstate conflicts, i.e., international war

³Although political violence could end up in civil wars, this will not always be the case

Figure 10: Conflict Magnitude score MEPV Differences, International or Civil

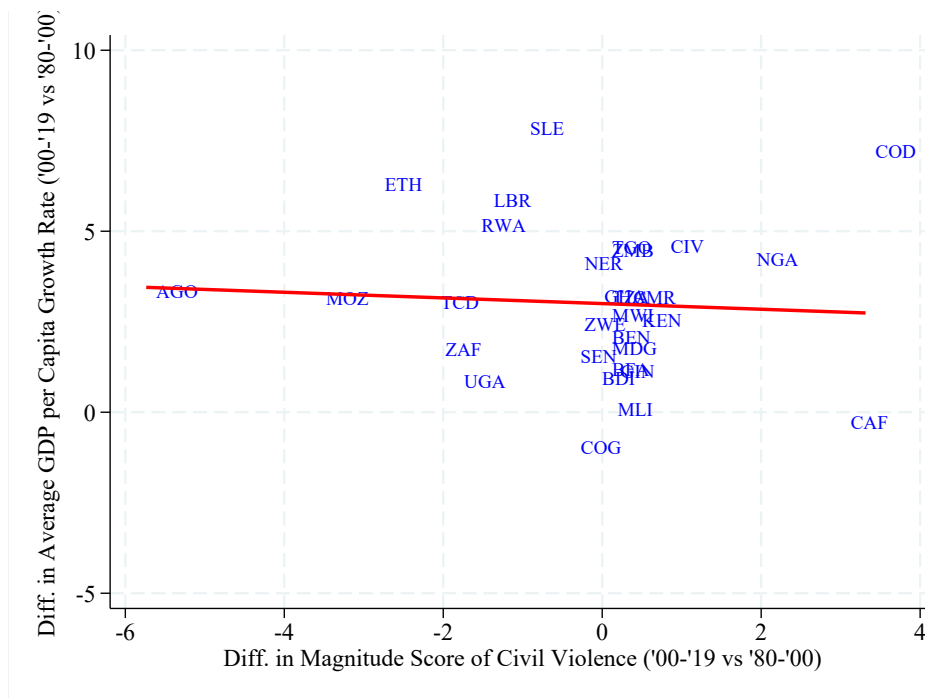


Notes: This figure plots on the vertical axis the percentage points differential of the average annualized growth rate of output per capita between the period 00-19 vs. the period 80-00, and on the horizontal axis the differential in the magnitude of the score of international or civil violence episodes between the same periods. We use the metric “Total summed magnitudes of all societal violence”. Conflicts (international war and civil conflict) data comes from the Major Episode of Political Violence (MEPV) and Conflict Regions database, taken from the Center for Systemic Peace, CSP. Data of output extracted from the IMF. Data on population from the PWT.

and civil conflict and (2) the magnitude of all civil conflicts, i.e., civil violence/war and ethnic violence/war

In Figure 10, we plot the difference in conflict magnitude – either civil or international – scores between the two periods, 2000-2009 and 1980-2000 against the average annual growth rate of GDP per capita differential in the same periods. The scatter plot and line of best fit shows that there is a slight negative correlation between conflict magnitude scores and GDP per capita. This means that as the magnitude of violence reduces, there is an expansion in GDP per capita. In Figure C6, we plot the average conflict magnitude scores separately for each period, i.e. from 1980 to 2000 and 2000 to 2019. Both figures also show a similar correlation pattern suggesting that even within periods, the countries with low political violence grew the most. Again, in Figure 11, we plot the difference in magnitude conflict against GDP per capita but this time we restricted the analysis to only civil conflicts. Similar to what we did for civil and international conflict, we show a disaggregation of the analysis for each period in Figure C7, where we separately plot the average magnitude score of civil conflicts for the two periods against GDP per capita. Again, in all of

Figure 11: Conflict Magnitude score MEPV Differences, Civil



Notes: This figure plots in the vertical axis the average annualized growth rate percent point differential of the period 00-19 vs. the period 80-00, and in the horizontal axis the differential in the magnitude of the score of civil violence episodes between the same periods. The magnitude of all civil conflicts (civil violence, civil war, ethnic violence, and ethnic war) comes from the Major Episode of Political Violence (MEPV) and Conflict Regions database, taken from the Center for Systemic Peace, CSP. Data of output extracted from the IMF. Data on population from the PWT.

the plots, the line of best fit is trending downwards, albeit at a slower pace, indicating the weak negative association between the magnitude of conflicts and GDP per capita was still apparent.

Though the general correlation between conflict magnitude scores and GDP per capita growth was weak, a few patterns emerge. Many of the countries were centered around the origin which suggests that there was a near zero change in the conflict magnitude score, regardless of the conflict measure, between the period 1980 and 2000 and from 2000 to 2019. Furthermore, countries such as Angola, Mozambique, and Ethiopia show how reducing conflicts can translate into strong progress in expanding output per capita. These countries belonged to either Cluster 1 (i.e., Angola) or Cluster 2 (i.e., Ethiopia and Mozambique) which grew from capital accumulation. Conversely, countries such as Mali, Congo, and Central African Republic are bad examples of how violence, either political or civil, can lead to stagnation and economic decline⁴. D.R. of the Congo, which belonged to Cluster 2, was an outlier here, where despite the tremendous increase in the magnitude of violence, there was a significant expansion of output as well. This finding reinforces our earlier

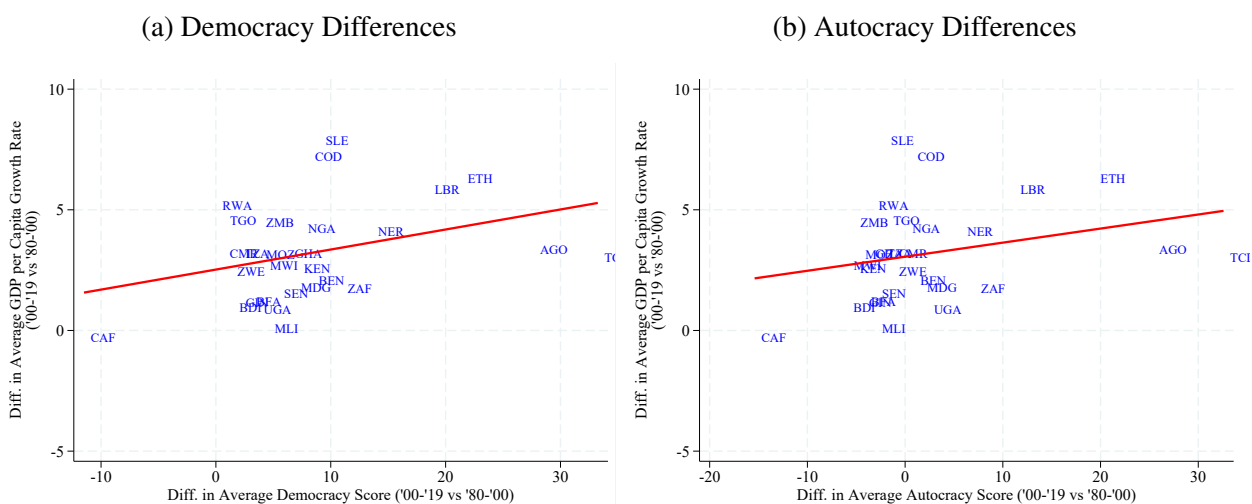
⁴Mali belonged to the fourth cluster, Congo was Cluster 2, and the Central African Republic was the only country in Cluster 5

results that increased political stability translates economic stability and progress.

6.2.3. Governance and Institutions

In this section, we use different measures of governance and institutions' quality to analyze how the African context varied in time, following the idea that better institutions tend to boost growth by increasing investment. To address the African institutional context, we use two sources of data. First, we use the Polity IV project, in which data on authority characteristics of states are coded to reflect political regime characteristics and transitions. We use 2 measures of the data set that are the ones used to code the Polity IV variable, which are the democracy measure and the autocracy measure (Polity IV basically subtracts the autocracy to the democracy level).

Figure 12: Governance Vs. GDP per Capita

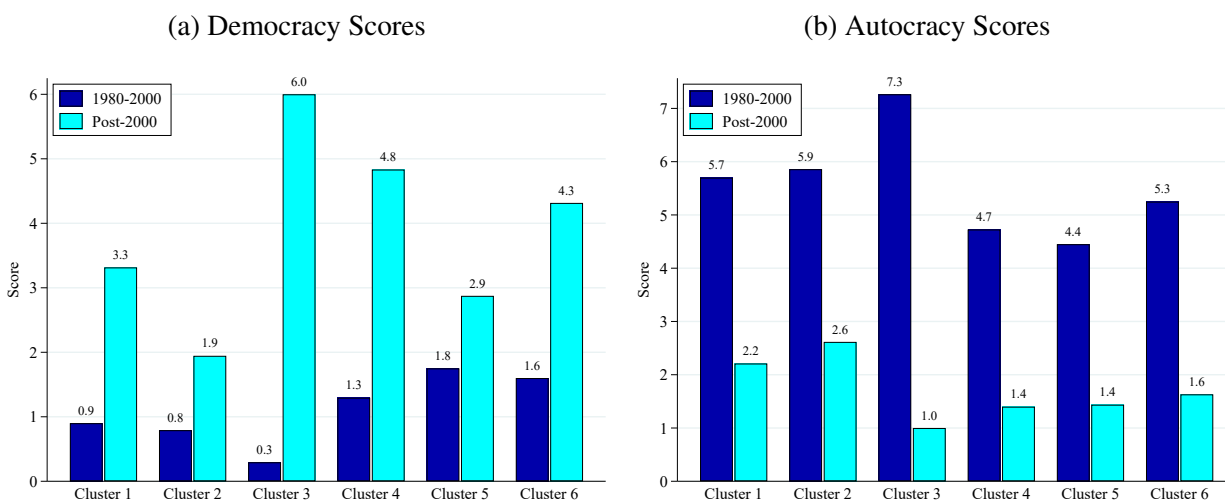


Notes: This figure plots in the vertical axis the average annualized growth rate differential of the periods 80-00 and 00-19, and in the horizontal axis difference in the magnitude of the score of the autocracy index between the same periods. The autocracy index is from the Polity IV project (taken from the Center for Systemic Peace, CSP). Data of output extracted from the IMF. Data on population from the PWT.

In Figure 12 we examine the correlation between democracy scores and average growth rate (left figure) and autocracy scores and average growth rate (right figure), respectively. We plot on the x-axis the difference in the institutionalized democracy or autocracy scores in two periods, 2000-2009 and 1980-2000, and on the y-axis, the average annual growth rate of GDP per capita differential in the same periods. Whereas in Figures C8 and C9, we plot the average democracy and autocracy scores against the average annualized growth rate of output per capita for the two periods, 1980-2000 and 2000-2009, respectively. In Figure 12, we demonstrate through the scatter plots that a positive correlation exists between democracy and growth on one hand as well as autocracy and growth on the other. The relationship between both democracy and economic de-

velopment and autocracy and economic development remained unchanged even after adjusting for period fixed effects as seen in Figures C8 and C9 respectively.

Figure 13: Democracy and Autocracy Scores for the Period 1980-2000 Vs. Post-2000 for each Cluster

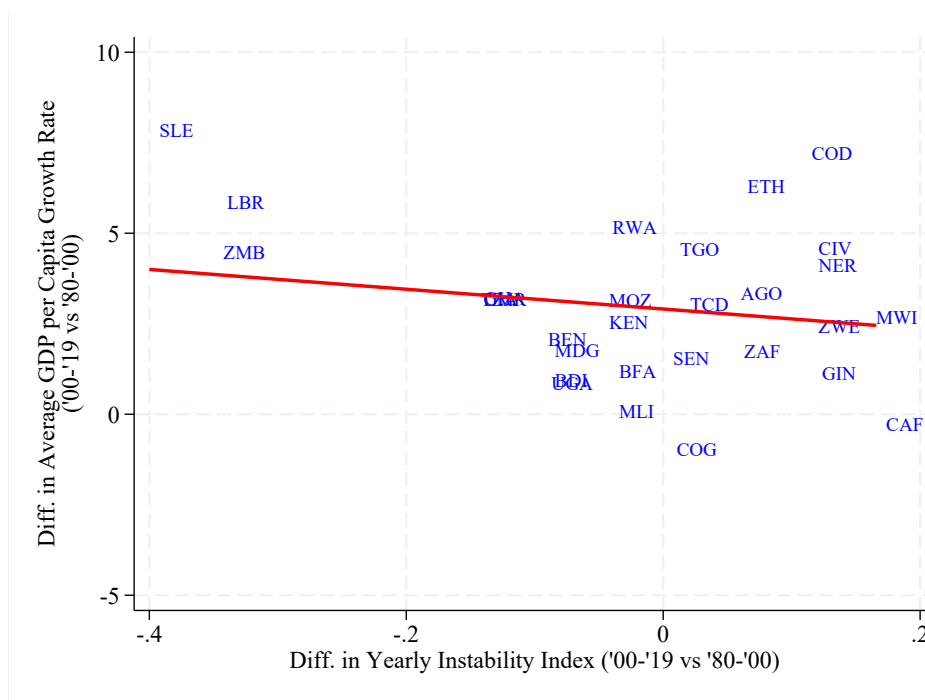


Notes: This figure plots a bar chart of average democracy and autocracy scores for the periods 80-00 and 00-19. The autocracy and democracy indices are from the Polity IV project (taken from the Center for Systemic Peace, CSP).

Examining the democracy and autocracy data along the clusters highlight a shifts from autocracy to democracy across African countries in our sample, as shown in Figure 13. Cluster 3 had the most dramatic improvements (decline) in democracy (autocracy) scores, jumping (dropping) from near zero (above seven) to six (one). This exhibits the considerable progress made by countries such as D.R. of the Congo and Sierra Leone towards democratization. These two countries, which belong to cluster 5, underwent significant transformation from war and conflicts in the pre-2000 era to improvements in democratic institutions post-2000. Clusters 1 and 6 also observed marked progress towards democratization, albeit at relatively moderate levels compared to cluster 5. Lastly, the remaining clusters – 2, 3, and 4 – also show modest movements towards democratization but are still notable.

The second source of data on institutions' quality is the Coups D'Etat Events (taken from the Center for Systemic Peace, CSP) which provides information on successful coups D'Etat, attempted coups, alleged coups reported by the government, auto-coups, ouster of leadership by foreign, and rebel forces and assassinations as well as resignation of executive due to poor performance. We construct two measures of "instability". First, we construct a dummy variable that for each year expresses if the country had any type of instability in terms of coups (successful, attempts, or alleged), ouster of leadership, or resignation. We then take the difference in mean for the period 1980-2000 and 2000-2019.

Figure 14: Instability Index Differences



Notes: This figure plots in the vertical axis the average annualized growth rate differentials for the periods 80-00 and 00-19, and in the horizontal axis the magnitude of difference in the score of the instability index between the same periods. The instability index was calculated using data from the Coups D’Etat Events. Data of output extracted from the IMF. Data on population from the PWT.

Figure 14 shows the correlation between this first measure and the aggregate growth showing that those countries with lower instability measures had higher growth. In addition, in Figure C10 we plot the average instability index for the two periods, 1980-2000 and 2000-2019, against the average annual growth rate in the same periods. As it is possible that those countries with higher instability in the 2000s had also higher instability in the period 1980-2000, and in that case, this variable would not explain the increase in growth in the 2000s we construct a second variable with the difference between the probability of having an instability episode for both periods. A positive number for these measures means that the country had a decrease in years with at least one instability episode. Figure 14 shows that those countries with decreased instability between the periods recorded higher aggregate growth.

The findings from this section highlight several key relationships. First, the reductions in conflicts coincided with the growth of GDP per capita in Africa, suggesting a negative correlation between conflicts and growth. The clusters with most reduction in conflicts was clusters 1 and 2 which also grew from capital accumulation, reinforcing the earlier findings. Second, there has been a marked improvement in institutionalized democracy in the period post-2000 compared to two

decades prior to that. Cluster 3 which grew primarily from TFP, recorded the greatest improvement in democracy, implying a plausible cause for their growth. and growth rate of output.

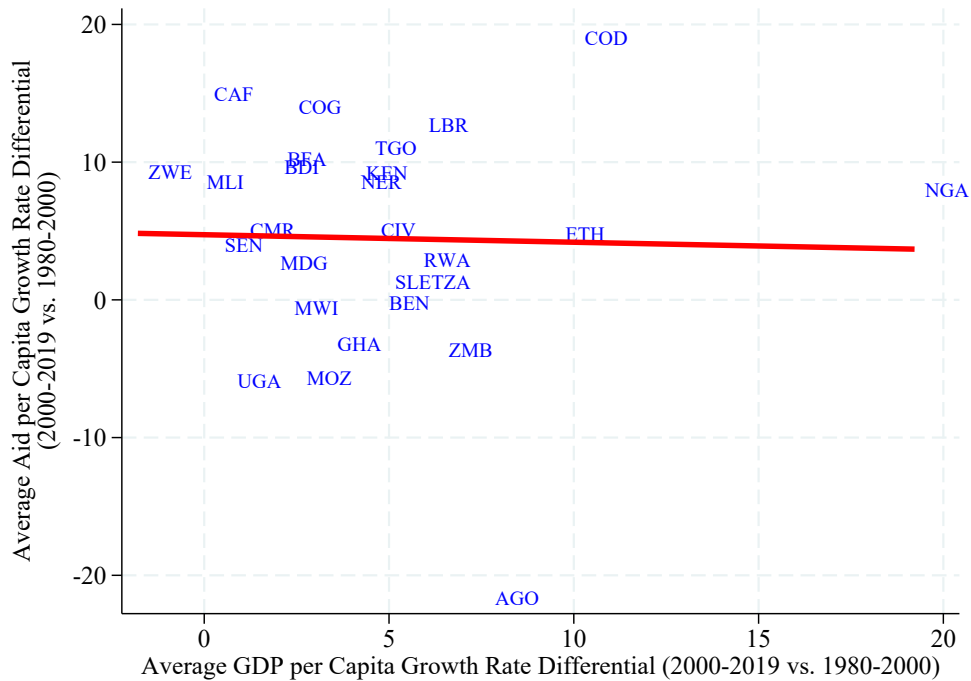
6.3. Foreign Aid

In the previous sections, we argued how improved stable political environment across SSA countries have resulted in massive investments. Investment can either come in as foreign direct investment or foreign aid. Therefore, in this section, we analyze the contribution of foreign aid to the development process of SSA countries. The economic literature on the effectiveness of foreign aid in economic development has been inconclusive. Although some authors have argued that foreign aid can act as a catalyst for growth (Sachs, 2006), others still argue that foreign aid deters growth (Easterly, 2003). Foreign aid has the potential to foster economic growth when applied appropriately and efficiently in the presence of good governance and economic policies (Burnside and Dollar, 2000). Foreign aid can enhance economic growth and development by improving physical capital and TFP. A recent micro-study by De and Becker (2015) shows the effectiveness of foreign aid in improving education, health, and water delivery outcomes. However, without the proper management in terms of its allocation and governance, foreign aid is incapable of achieving the desired economic outcomes.

To examine this issue critically, we download net official development assistance (ODA) receipts data from the World Bank's World Development Indicators to proxy for foreign aid. The World Bank defines ODA as the "disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent)". The ODA data are in current US dollars. We calculate the annualized ODA per capita growth rate and conduct several analyses with it.

First, in Figure 15, we plot the changes in the annualized growth rate of ODA per capita across two periods, 1980-2000 and 2000-2018, against the changes in the annualized growth rate of GDP per capita across the same period. The plot examines the relationship between the growth of aid and GDP per capita respectively. Here the focus is on the average differentials across the two periods. As a robustness check, in Appendix Figure C11, we illustrate the relationship between the average annualized growth rate of aid and GDP per capita for two different periods: 1980 to 2000 and 2000 to 2019. The left graphic plots the average annualized growth rate of ODA per capita versus the average annualized growth rate of GDP per capita for the period 1980 to 2000 while the right one plots the same variables but for the period 2000-2018. We conducted these two analyses to

Figure 15: Foreign Aid and GDP per Capita



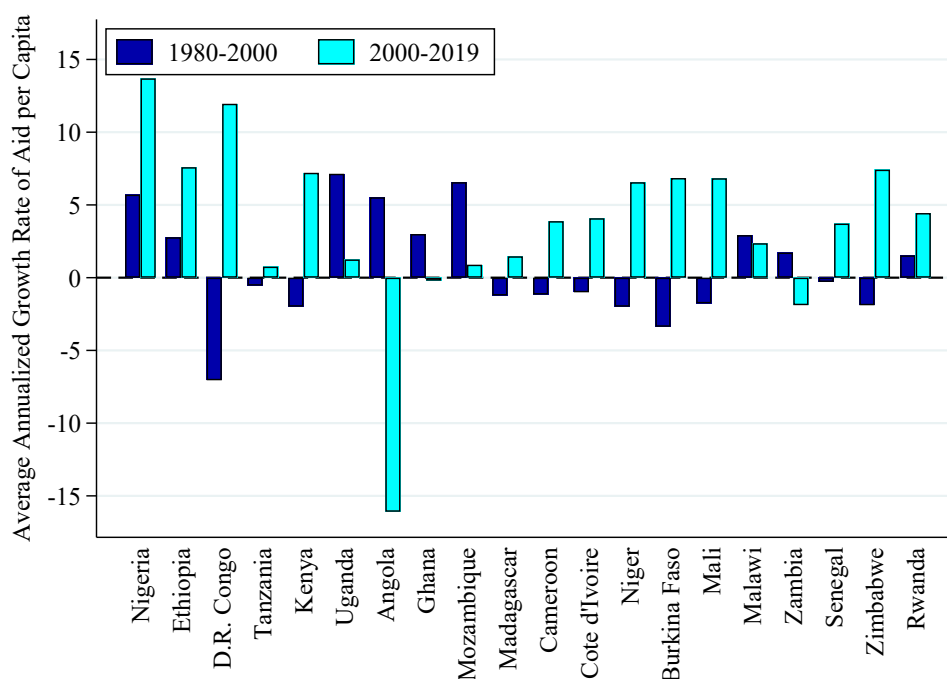
Notes: This figure plots the difference in the average annualized growth rate of GDP per capita between the period 1980-2000 and 2000-2018 against on average annualized growth rate of foreign aid per capita. Data on foreign aid comes from the World Bank while data on GDP per capita is from the PWT.

investigate the relationship between the growth of aid and GDP per capita. Positive values indicate an improvement in rates of growth of ODA or GDP per capita in the period 2000-2019 compared to the period 1980-2000 while the reverse holds for negative values.

We observe a fairly flat but downward-sloping line of best fit which suggests a weak negative correlation between the growth rate of aid and output per capita as shown in Figure 15. Specifically, countries that had a positive ODA per capita growth rate differential between the periods 1980-2000 and 2000-2018, also had low GDP growth rate differential between the same period. Also, in Figure C11, we show an almost flat fitted regression line between the average annualized growth rate of GDP and aid per capita for the period 1980 to 2000 and 2000 to 2019 respectively. This suggests little to no correlation between GDP and aid per capita growth rates for both periods.

Although we can not establish from these two graphics if foreign aid correlates positively with GDP growth rate or otherwise, some key patterns emerge. For example, the substantial improvements in aid inflows for conflict-afflicted countries such as Liberia and D.R. of the Congo increased their GDP per capita growth rate differential by more than 5 percent. On the other hand, other conflict-prone countries such as Burkina Faso, Burundi, the Central African Republic, and Mali

Figure 16: Annualized Growth Rate of ODA per Capita in Sub-Saharan Africa

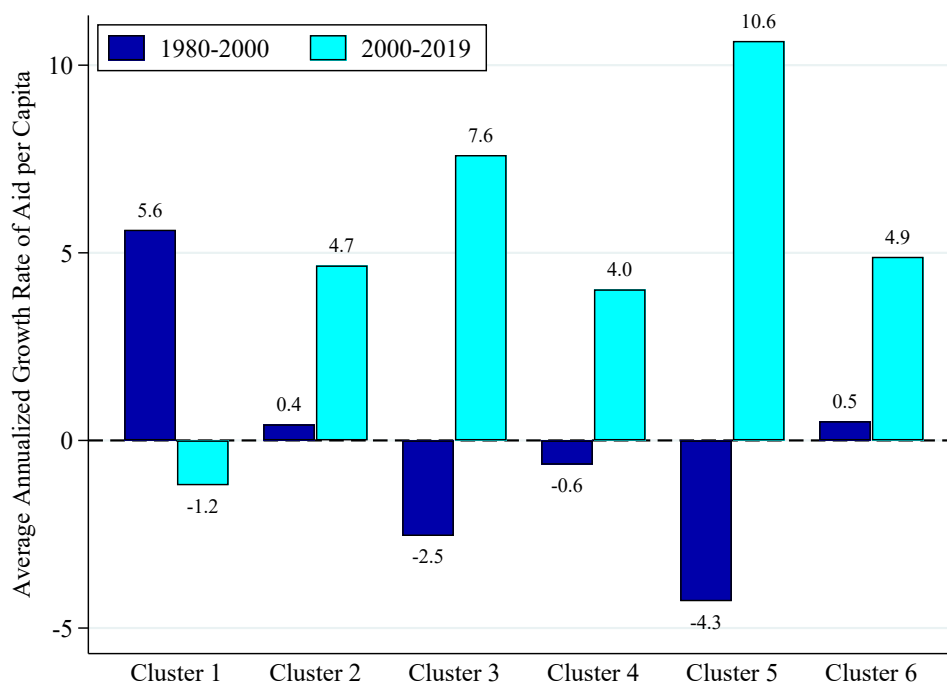


Notes: This figure plots a bar chart of the average annualized growth rate of foreign aid per capita for the period 1980-2000 and 2000-2018 for the six clusters of countries. Data on foreign aid comes from the World Bank while data on GDP per capita is from the PWT

benefited substantially from foreign aid, but they could not translate it into a considerable rise in GDP per capita. Still, other conflict countries such as Côte d’Ivoire, Rwanda, and Sierra Leone though observed a modest rise in aid per capita, these countries were able to significantly increase their GDP per capita growth. Several other countries were located close to the middle which suggests a moderate impact of aid on growth for these countries. Angola and Nigeria were the two outliers. Whereas Angola had negative foreign aid growth rate differentials between the period 1980-2000 and 2000-2018 but was able to improve GDP per capita massively during the same period, Nigeria had positive growth in both aid and GDP per capita. These results imply that whereas foreign aid can act as a significant driver of economic growth for some countries, especially in conflict-ridden ones, its impact is limited for others.

Moreover, in Figure 16, we plot a bar chart of the annualized growth rate of ODA per capita for the twenty most populous countries in the SSA over two the period 1980 and 2000 as well as the period 2000 to 2018. The dark blue bars represent the annualized growth rate of ODA per capita for the period 1980-2000, while the light blue bars are for the period 2000-2018. In Figure 17, we did the same analysis as in Figure 16, but this time we restricted the analysis to our six clusters

Figure 17: Annualized Growth Rate of ODA per Capita for the Six Clusters



Notes: This figure plots a bar chart of the average annualized growth rate of foreign aid per capita for the period 1980-2000 and 2000-2018 for the top 20 most populous countries in Africa. Data on foreign aid comes from the World Bank while data on GDP per capita is from the PWT

of countries. We conducted this analysis to compare the average growth rates of aid for the two periods. This allows us to measure how aid inflows have changed over the past few decades.

From Figure 16, foreign aid advanced to SSA countries increased in the period 2000-2019 compared with the period 1980-2000. In fact, most countries had negative or near zero growth of ODA per capita in the period 1980 to 2000 but recorded positive growth post-2000. The only oddity was Angola and Zambia which had positive aid growth between 1980 and 2000 but reversed to negative growth in the post-2000 period. However, foreign aid was not distributed equitably across Africa. Countries such as D.R. of the Congo, Ethiopia, Kenya, Nigeria, and Sudan had the highest percentage points increase in ODA per capita growth rate between the two periods. The common theme running through these countries during both periods was political instability characterized by civil wars and military coups. Similar trends could be seen in conflict-prone countries such as Burundi, the Central African Republic, Liberia Sierra Leone, and Togo (refer to Table B9 in the Appendix). This suggests that the majority of aid inflows to SSA were mostly targeted at politically unstable countries.

We continue our analysis and show in Figure 17 that, except for the first cluster which saw a

marginal decline in aid advanced to them, all the other clusters experienced positive growth rate in aid per capita. Moreover, cluster one significantly receive much greater assistance from development partners during the period 1980 and 2000 but it was followed by a slight drop post-2000. The decline in aid advanced to countries in the first cluster is mainly due to the significant drop in aid advanced to Angola. Countries in the second cluster saw a moderate growth in aid for the period 1980-2000 but rose considerable by about 5 percent in the post-2000 period. Cluster 3 recorded the second most growth in aid per capita. Growth in development assistance advanced to countries in this cluster was about negative 3 percent between 1980 and 2000 but improved dramatically to almost 8 percent for the period 2000-2019.

There was near zero growth in aid recorded in the period 1980-2000 for the fourth cluster, however, aid advanced to countries in this cluster increased by about 4 percent. This cluster witnessed the third highest percentage points improvement in development aid assistance. The cluster which saw the most aid advanced to them, in terms of percentage points increase over the two-periods, was Cluster 5. Countries in this cluster, saw a stark reversal in the growth of development assistance by almost 15 percentage points, from a negative 4 percent in the 1980-2000 period to a positive 11 percent in the 2000-2019 period. The massive improvement in development assistance advanced to countries in Clusters 3, 4, and 5 is likely due to increased conflicts in these countries as we explained in Figure 9. The last cluster observed a marginal increase in foreign aid per capita from 1980 to 2000 but aid was boosted considerably in the post-2000 period. Since countries in this cluster did not record any conflicts or political instability, the increase in aid is likely due to socio-economic decline, especially in Zimbabwe.

In this section, we have explored the possible correlation between foreign aid and Africa's development. We show that there is no clear relationship between foreign aid and development, as aid was largely directed toward conflict-prone countries in SSA, particularly clusters 3, 4, and 5. However, cluster 5 experienced the greatest growth in aid, which may explain the increase in its capital per worker, albeit negative overall growth.

7. Conclusion

This paper studies the proximate causes of Africa's robust growth since the year 2000. We first scrutinize the veracity of the growth figures and ask whether they should be believed. We then proceeded to unravel the main proximate causes of Africa's growth through an accounting exercise and cluster analysis. Our findings reveal that the tremendous expansion in output per capita in Africa has elevated many of the continent's population out of abject poverty. We establish that the economic expansion did not only reduce poverty but there was substantial improvement in

the real standard of living over the period as well. These results indicate that Africa's growth should be believed. Our clustering analysis identified capital accumulation as the main factor behind economic growth in the majority of Africa's nations. Others grew due to TFP growth or a balanced mix of factor accumulation, TFP growth, and increases in employment rates. The clusters project differently onto changes in commodity prices, conflict, democratic governance, and foreign assistance, highlighting the diverse roots of Africa's growth miracles.

References

- ACEMOGLU, D., S. JOHNSON, AND J. A. ROBINSON (2001): “The Colonial Origins of Comparative Development: An Empirical Investigation,” *American Economic Review*, 91(5), 1369–1401.
- ACEMOGLU, D., S. NAIDU, P. RESTREPO, AND J. A. ROBINSON (2019): “Democracy Does Cause Growth,” *Journal of Political Economy*, 127(1), 47–100.
- AUDOLY, R., R. MCGEE, S. OCAMPO-DIAZ, AND G. PAZ-PARDO (2024): “The Life-cycle Dynamics of Wealth Mobility,” University of Western Ontario.
- BICK, A., N. FUCHS-SCHÜNDELN, AND D. LAGAKOS (2018): “How Do Hours Worked Vary with Income? Cross-country Evidence and Implications,” *American Economic Review*, 108(1), 170–199.
- BURNSIDE, C., AND D. DOLLAR (2000): “Aid, Policies, and Growth,” *American Economic Review*, 90(4), 847–868.
- CASELLI, F. (2005): “Accounting for Cross-country Income Differences,” *Handbook of Economic Growth*, 1, 679–741.
- DE, R., AND C. BECKER (2015): “The Foreign Aid Effectiveness Debate: Evidence from Malawi,” *Online], vol. March, no. Working Paper*, 6.
- DEATON, A. (1999): “Commodity Prices and Growth in Africa,” *Journal of Economic Perspectives*, 13(3), 23–40.
- EASTERLY, W. (2003): “Can Foreign Aid Buy Growth?,” *Journal of Economic Perspectives*, 17(3), 23–48.
- EE, C. Y. (2016): “Export-led Growth Hypothesis: Empirical Evidence from Selected Sub-Saharan African Countries,” *Procedia Economics and Finance*, 35, 232–240.
- FOSU, A. K. (1990): “Exports and Economic Growth: the African Case,” *World Development*, 18(6), 831–835.
- (1992): “Political Instability and Economic Growth: Evidence from Sub-Saharan Africa,” *Economic Development and Cultural Change*, 40(4), 829–841.
- (2009): “Inequality and the Impact of Growth on Poverty: Comparative Evidence for Sub-Saharan Africa,” *The Journal of Development Studies*, 45(5), 726–745.

- (2015): “Growth, Inequality, and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context,” *Oxford Development Studies*, 43(1), 44–59.
- GOLLIN, D. (2002): “Getting Income Shares Right,” *Journal of Political Economy*, 110(2), 458–474.
- GOLLIN, D., D. LAGAKOS, AND M. E. WAUGH (2014): “The Agricultural Productivity Gap,” *The Quarterly Journal of Economics*, 129(2), 939–993.
- HSIEH, C.-T., AND P. J. KLENOW (2010): “Development Accounting,” *American Economic Journal: Macroeconomics*, 2(1), 207–223.
- HUMPHRIES, J. E. (2017): “The Causes and Consequences of Self-employment over the Life Cycle,” Yale University.
- JERVEN, M. (2015): *Africa: Why Economists Get It Wrong*. Zed Books Ltd.
- MCMILLAN, M., D. RODRIK, AND Í. VERDUZCO-GALLO (2014): “Globalization, Structural Change, and Productivity Growth, with an Update on Africa,” *World Development*, 63, 11–32.
- MOLD, A., AND A. PRIZZON (2015): “Commodity Prices and Export Performance in Sub-Saharan African Countries,” in *Handbook on Trade and Development*, pp. 232–244. Edward Elgar Publishing.
- PINKOVSKIY, M., AND X. SALA-I MARTIN (2014): “Lights, Camera,... Income!: Estimating Poverty Using National Accounts, Survey Means, and Lights,” FRB of New York Staff Report No. 669.
- RODRIK, D. (1999): “Where Did All the Growth Go? External Shocks, Social Conflicts, and Growth Collapses,” *Journal of Economic Growth*, 4(4), 385–412.
- (2018): “An African Growth Miracle?,” *Journal of African Economies*, 27(1), 10–27.
- SACHS, J. D. (2006): *The End of Poverty: Economic Possibilities for our Time*. Penguin.
- STRAUS, S. (2012): “Wars Do End! Changing Patterns of Political Violence in Sub-Saharan Africa,” *African Affairs*, 111(443), 179–201.
- YOUNG, A. (1994): “Lessons from the East Asian NICs: A Contrarian View,” *European Economic Review*, 38(3-4), 964–973.
- (2012): “The African Growth Miracle,” *Journal of Political Economy*, 120(4), 696–739.

ZAHONOGO, P. (2016): “Trade and Economic Growth in Developing Countries: Evidence from Sub-Saharan Africa,” *Journal of African Trade*, 3(1), 41–56.

8. Appendix A: Description of Regions and Start Years of Data

Below is a description of the regions:

Sub-Sahara Africa Region refers to: Angola, Burkina Faso, Burundi, Cameroon, Chad, Congo, Dem. Rep., Congo, Rep., Ethiopia, Gambia, Ghana, Kenya, Lesotho, Liberia, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Togo, Uganda, Central African Republic, Côte d'Ivoire, Guinea, and Tanzania.

Rest of Africa is: Algeria, Comoros, Djibouti, Eritrea, Guinea-Bissau, Libya, Morocco, Somalia, Tunisia, Mauritania, and South Sudan.

Rest of the World: Afghanistan, Argentina, Azerbaijan, Bangladesh, Bosnia and Herzegovina, Cambodia, Colombia, Croatia, Ecuador, Egypt, Arab Rep., El Salvador, Georgia, Grenada, Guatemala, Haiti, India, Indonesia, Iran, Islamic Rep., Iraq, Israel, Kuwait, Lao PDR, Lebanon, Malaysia, Moldova, Myanmar, Nepal, Nicaragua, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Romania, Russian Federation, Serbia, Spain, Sri Lanka, Suriname, Syrian Arab Republic, Tajikistan, Thailand, Trinidad and Tobago, Turkiye, United Kingdom, Uzbekistan, Venezuela, RB, Vietnam, Yemen, Rep., China, North Macedonia, United States, Jordan, Kyrgyz Republic, and Ukraine.

Rest of the world without Middle East: Afghanistan, Argentina, Azerbaijan, Bangladesh, Bosnia and Herzegovina, Cambodia, Colombia, Croatia, Ecuador, Georgia, Grenada, Guatemala, Haiti, India, Indonesia, Lao PDR, Malaysia, Mexico, Moldova, Myanmar, Nepal, Nicaragua, Pakistan, Panama, Paraguay, Peru, Philippines, Romania, Russian Federation, Serbia, Sri Lanka, Suriname, Thailand, Trinidad and Tobago, United Kingdom, Uzbekistan, Venezuela, RB, Yemen, Rep., Papua New Guinea, North Macedonia, Tajikistan, United States, Kyrgyz Republic, and Ukraine

Table A1: Starting Years of Data from the Different Sources

Country	PWT					IMF		WB
	GDP	Capital	Human Capital	Employees	Population	GDP	Capital	GDP
Angola	1970	1970	1970	1970	1970	1970	1950	1990
Benin	1959	1959	1959	1980	1959	1960	1950	1990
Burkina Faso	1959	1959	1960	1959	1959	1960	1950	1990
Burundi	1960	1960	1960	1980	1960	1960	1950	1990
Cameroon	1960	1960	1960	1960	1960	1960	1950	1990
Central African Republic	1960	1960	1960	1980	1960	1960	1950	1990
Chad	1960	1960		1960	1960	1960	1950	1990
China	1952	1952	1952	1952	1952	1960	1950	1990
Congo	1960	1960	1960	1960	1960	1960	1950	1990
Côte d'Ivoire	1960	1960	1960	1960	1960	1960	1950	1990
D.R. of the Congo	1950	1950	1950	1950	1950	1960	1950	1990
Ethiopia	1950	1950	1960	1950	1950	1960	1950	1990
Ghana	1955	1955	1955	1955	1955	1960	1950	1990
Guinea	1959	1959		1980	1959	1960	1950	1990
Hong Kong	1960	1960	1960	1960	1960	1960	1950	1990
Kenya	1950	1950	1950	1950	1950	1960	1950	1990
Liberia	1964	1964	1964	1980	1964	1964	1950	2000
Madagascar	1960	1960	1960	1960	1960	1960	1950	1990
Malawi	1954	1954	1954	1954	1954	1960	1950	1990
Mali	1960	1960	1960	1960	1960	1960	1950	1990
Mozambique	1960	1960	1960	1960	1960	1960	1950	1990
Niger	1960	1960	1960	1960	1960	1960	1950	1990
Nigeria	1950	1950	1960	1950	1950	1960	1950	1990
Republic of Korea	1953	1953	1953	1953	1953	1960	1950	1990
Rwanda	1960	1960	1960	1960	1960	1960	1950	1990
Senegal	1960	1960	1960	1960	1960	1960	1950	1990
Sierra Leone	1961	1961	1961	1980	1961	1961	1950	1990
Singapore	1960	1960	1960	1960	1960	1960	1950	1990
South Africa	1950	1950	1950	1950	1950	1960	1950	1990
Taiwan	1951	1951	1951	1951	1951	1960	1950	
Thailand	1950	1950	1950	1950	1950	1960	1950	1990
Togo	1960	1960	1960	1980	1960	1960	1950	1990
U.R. of Tanzania: Mainland	1960	1960	1960	1960	1960	1960	1950	1990
Uganda	1950	1950	1950	1950	1950	1960	1950	1990
Viet Nam	1970	1970	1970	1970	1970	1970	1950	1990
Zambia	1955	1955	1955	1955	1955	1960	1950	1990
Zimbabwe	1954	1954	1954	1954	1954	1960	1950	1990

Notes: All data ends in 2019.

9. Appendix B: Tables

Table B1: Hours Worked and Employment Rates

	SSA	East Asia	Western Europe	Other Developed
Avg. Weekly Hours Worked	24.8	26.7	17.9	23.1
Employment Rates (%)	64.6	62.4	55.6	62.4

Source: [Bick, Fuchs-Schündeln, and Lagakos \(2018\)](#)

Table B2: Population in 2019 - Africa

Country	Population	Percentage	Cumulative
Nigeria	200.96	19.91	19.91
Ethiopia	112.08	11.11	31.02
D.R. of the Congo	86.79	8.60	39.62
South Africa	58.56	5.80	45.42
U.R. of Tanzania: Mainland	56.38	5.59	51.01
Kenya	52.57	5.21	56.22
Uganda	44.27	4.39	60.61
Angola	31.83	3.15	63.76
Ghana	30.42	3.01	66.78
Mozambique	30.37	3.01	69.78
Madagascar	26.97	2.67	72.46
Cameroon	25.88	2.56	75.02
Côte d'Ivoire	25.72	2.55	77.57
Niger	23.31	2.31	79.88
Burkina Faso	20.32	2.01	81.89
Mali	19.66	1.95	83.84
Malawi	18.63	1.85	85.69
Zambia	17.86	1.77	87.46
Senegal	16.30	1.61	89.07
Chad	15.95	1.58	90.65
Zimbabwe	14.65	1.45	92.10
Guinea	12.77	1.27	93.37
Rwanda	12.63	1.25	94.62
Benin	11.80	1.17	95.79
Burundi	11.53	1.14	96.93
Togo	8.08	0.80	97.73
Sierra Leone	7.81	0.77	98.51
Congo	5.38	0.53	99.04
Liberia	4.94	0.49	99.53
Central African Republic	4.75	0.47	100.00

Notes: Data from the Penn world Table. This figure includes population data from 2019, latest year available for countries in the African continent, including all African countries with population of more than 2 million excluding the North African countries. Population data expressed in millions of people.

Table B3: African Average Annual Growth Rate of Output Per Capita – All countries

Country	'80 - '00	'00 - '19	'80 - '00 vs. '00 - '19
Angola	-1.9	5.7	7.6
Benin	-1.1	3.6	4.7
Burkina Faso	0.7	2.6	2.0
Burundi	-1.4	0.5	1.9
Cameroon	0.5	1.4	1.0
Central African Republic	-0.4	-0.4	0.0
Chad	0.5	2.3	1.8
Congo	0.6	2.8	2.3
Côte d'Ivoire	-0.5	4.0	4.5
D.R. Congo	-6.7	3.3	10.0
Ethiopia	-1.1	8.4	9.5
Ghana	-0.4	2.9	3.3
Guinea	-1.1	-0.7	0.4
Kenya	-0.3	3.7	4.1
Liberia	-4.5	1.3	5.8
Madagascar	-0.9	0.9	1.8
Malawi	-1.3	0.8	2.2
Mali	3.4	3.2	-0.2
Mozambique	-0.4	2.1	2.5
Niger	-3.2	0.8	4.0
Nigeria	-8.8	10.4	19.2
Rwanda	-1.3	4.4	5.7
Senegal	0.8	1.1	0.3
Sierra Leone	-1.5	3.4	4.9
South Africa	-0.5	1.4	1.9
U.R. of Tanzania: Mainland	-2.1	3.8	5.9
Togo	-2.0	2.3	4.3
Uganda	2.1	2.7	0.6
Zambia	-1.4	4.9	6.3
Zimbabwe	0.6	-1.2	-1.8

Notes: This table shows annualized growth rates of output per capita for all African countries with population of more than 2 million in 2019 and excluding the North African countries. The annualized growth rates were calculated for two periods: 1980 to 2000 and 2000 to 2019. The third column is the difference of percent points of growth rates between the second and the first period. Gross domestic product per capita in thousands of constant 2017 international dollars. Data collected from the Penn World Table.

Table B4: African Average Annual Growth rate of Capital per Worker – All countries

Country	'80 - '00	'00 - '19	'80 - '00 vs. '00 - '19
Angola	0.2	4.2	4.0
Benin	3.9	1.4	-2.5
Burkina Faso	4.1	4.2	0.0
Burundi	0.7	-0.7	-1.4
Cameroon	2.4	2.1	-0.3
Central African Republic	-2.0	5.3	7.3
Chad	-2.4	4.1	6.5
Congo	0.9	7.4	6.5
Côte d'Ivoire	0.9	6.3	5.4
D.R. Congo	0.0	-1.8	-1.8
Ethiopia	4.4	7.4	3.0
Ghana	-0.7	0.1	0.8
Guinea	0.4	2.3	1.9
Kenya	-0.1	3.5	3.6
Liberia	-3.0	2.7	5.7
Madagascar	2.9	0.6	-2.3
Malawi	2.9	-3.2	-6.1
Mali	6.2	4.8	-1.4
Mozambique	0.0	7.3	7.4
Niger	-3.0	1.9	4.9
Nigeria	-6.8	4.0	10.8
Rwanda	6.8	7.4	0.6
Senegal	2.0	-0.3	-2.3
Sierra Leone	11.7	-2.5	-14.2
South Africa	-0.7	3.9	4.5
U.R. of Tanzania: Mainland	0.3	2.3	1.9
Togo	-2.8	3.3	6.1
Uganda	2.1	3.0	0.9
Zambia	4.3	2.1	-2.3
Zimbabwe	6.5	-2.7	-9.1

Note: This table shows annualized growth rates of capital per worker of all African countries with population of more than 2 million in 2019 and excluding the North African countries. The annualized growth rates were calculated for two periods: 1980 to 2000 and 2000 to 2019. The third column is the difference of percent points of growth rates between the second and the first period. Capital per worker in thousands of constant 2017 international dollars. Data collected from the Penn World Table.

Table B5: African Average Annual Growth Rate of Employment-to-Population – All countries

Country	'80 - '00	'00 - '19	'80 - '00 vs. '00 - '19
Angola	-0.4	-0.3	0.1
Benin	0.0	0.1	0.1
Burkina Faso	-0.3	-1.0	-0.7
Burundi	-0.6	0.2	0.8
Cameroon	-0.7	0.4	1.0
Central African Republic	-0.1	-0.1	0.0
Chad	0.0	-0.2	-0.2
Congo	0.1	0.7	0.5
Côte d'Ivoire	-0.1	-0.6	-0.5
D.R. of the Congo	-0.2	-0.8	-0.6
Ethiopia	-0.3	1.1	1.4
Ghana	-0.5	0.8	1.3
Guinea	-0.2	0.1	0.3
Kenya	0.4	0.5	0.1
Liberia	0.1	1.2	1.2
Madagascar	-0.1	0.7	0.9
Malawi	-0.3	0.5	0.8
Mali	-0.2	0.2	0.4
Mozambique	0.3	-0.4	-0.6
Niger	0.0	-0.6	-0.6
Nigeria	-0.8	0.8	1.6
Rwanda	-0.2	0.0	0.1
Senegal	0.7	0.7	0.0
Sierra Leone	-0.2	-0.2	0.0
South Africa	0.2	0.2	0.0
Togo	0.2	-0.2	-0.5
U.R. of Tanzania: Mainland	-0.2	0.1	0.3
Uganda	-0.3	1.1	1.4
Zambia	-0.4	0.4	0.8
Zimbabwe	0.0	0.5	0.4

Notes: This table shows annualized growth rates of the ratio of Employment to Population, including all African countries with a population of more than 2 million in 2019 and excluding the North African countries. The annualized growth rates were calculated for two periods: 1980 to 2000 and 2000 to 2019. The third column is the difference in percent points of growth rates between the second and the first period. Data on population and number of employees were extracted from the Penn World Table.

Table B6: African Average Annual Growth rate of Human Capital – All countries

Country	'80 - '00	'00 - '19	'80 - '00 vs. '00 - '19
Angola	1.1	0.7	-0.4
Benin	1.3	1.6	0.3
Burkina Faso	0.3	1.0	0.7
Burundi	0.5	0.8	0.4
Cameroon	1.5	0.5	-1.0
Central African Republic	1.1	0.6	-0.6
Chad			
Congo	1.8	0.2	-1.6
Côte d'Ivoire	1.3	0.9	-0.4
D.R. of the Congo	1.4	0.4	-0.9
Ethiopia	0.7	1.1	0.3
Ghana	1.7	0.9	-0.8
Guinea			
Kenya	1.4	1.0	-0.4
Liberia	1.3	0.8	-0.5
Madagascar	1.1	0.6	-0.5
Malawi	0.8	1.4	0.5
Mali	0.4	1.0	0.6
Mozambique	0.1	0.4	0.3
Niger	0.5	0.5	0.0
Nigeria	1.0	1.6	0.6
Rwanda	0.7	1.8	1.1
Senegal	0.9	1.1	0.2
Sierra Leone	0.9	1.0	0.1
South Africa	0.6	1.8	1.2
Togo	1.5	0.3	-1.2
U.R. of Tanzania: Mainland	0.7	0.7	0.0
Uganda	1.4	2.0	0.6
Zambia	1.4	1.4	0.0
Zimbabwe	1.5	1.4	0.0

Notes: This table shows annualized growth rates of the human capital index, including all African countries with population of more than 2 million in 2019 and excluding the North African countries. The annualized growth rates were calculated for two periods: 1980 to 2000 and 2000 to 2019. The third column is the difference of percent points of growth rates between the second and the first period. Human capital index extracted from the Penn world Table.

Table B7: Average Annualized Growth rate of TFP – All Countries

Country	'80 - '00	'00 - '19	'80 - '00 vs. '00 - '19
Angola	−2.2	3.6	5.7
Benin	−3.6	2.0	5.5
Burkina Faso	−1.1	1.2	2.3
Burundi	−1.3	0.2	1.5
Cameroon	−0.8	−0.2	0.6
Central African Republic	0.0	−3.1	−3.1
Chad			
Congo	−0.9	−1.4	−0.5
Côte d'Ivoire	−1.4	1.1	2.6
D.R. Congo	−7.2	4.8	12.0
Ethiopia	−3.2	3.0	6.2
Ghana	−0.5	1.5	2.0
Guinea			
Kenya	−1.4	1.0	2.4
Liberia	−3.7	−1.6	2.1
Madagascar	−2.6	−0.4	2.2
Malawi	−2.8	1.2	4.0
Mali	0.5	0.2	−0.3
Mozambique	−0.7	−1.2	−0.5
Niger	−1.9	0.2	2.2
Nigeria	−5.4	6.6	12.0
Rwanda	−4.6	−0.1	4.5
Senegal	−1.3	0.0	1.2
Sierra Leone	−6.9	4.3	11.2
South Africa	−0.6	−1.5	−0.9
U.R. of Tanzania: Mainland	−2.4	2.2	4.6
Togo	−1.7	0.8	2.5
Uganda	0.7	−0.9	−1.5
Zambia	−3.6	2.8	6.4
Zimbabwe	−3.1	−1.1	2.1

Notes: This table shows annualized growth rates of the Solow residual, including all African countries with population of more than 2 million in 2019 and excluding the North African countries. The Solow residual was calculated following $A = y/(k^\alpha h^{1-\alpha} n)$ where y is output per capita, k is capital per worker, h is the human capital index, and n is workers per capita. The annualized growth rates were calculated for two periods: 1980 to 2000 and 2000 to 2019. The third column is the difference of percent points of growth rates between the second and the first period. Data collected from the Penn World Table.

Table B8: Share of GDP per Capita Growth Explained by Each Category Average Growth Rate between 2000-2019 – All Countries

Country	Output per Capita	Capital per Worker	Employment/ Population	Human Capital	TFP
Angola	5.7	35	-5	6	62
Benin	3.6	19	3	23	54
Burkina Faso	2.6	76	-39	19	44
Burundi	0.5	-63	40	83	41
Cameroon	1.4	71	28	16	-15
Central African Republic	-0.4	-575	17	-67	699
Chad	2.3	88	-11		
Congo	2.8	127	24	3	-51
Côte d'Ivoire	4.0	77	-16	12	28
D.R. Congo	3.3	-27	-24	6	147
Ethiopia	8.4	43	13	7	36
Ghana	2.9	2	29	17	52
Guinea	-0.7	-161	-13		
Kenya	3.7	46	13	14	26
Liberia	1.3	99	94	30	-121
Madagascar	0.9	33	82	33	-49
Malawi	0.8	-185	57	84	148
Mali	3.2	72	6	16	7
Mozambique	2.1	170	-18	11	-58
Niger	0.8	115	-71	31	26
Nigeria	10.4	19	7	8	63
Rwanda	4.4	82	-1	22	-2
Senegal	1.1	-13	65	52	-4
Sierra Leone	3.4	-36	-7	15	129
U.R. of Tanzania: Mainland	3.8	29	2	10	58
Togo	2.3	69	-11	6	36
Uganda	2.7	53	41	38	-32
Zambia	4.9	20	8	15	57
Zimbabwe	-1.2	111	-41	-64	91

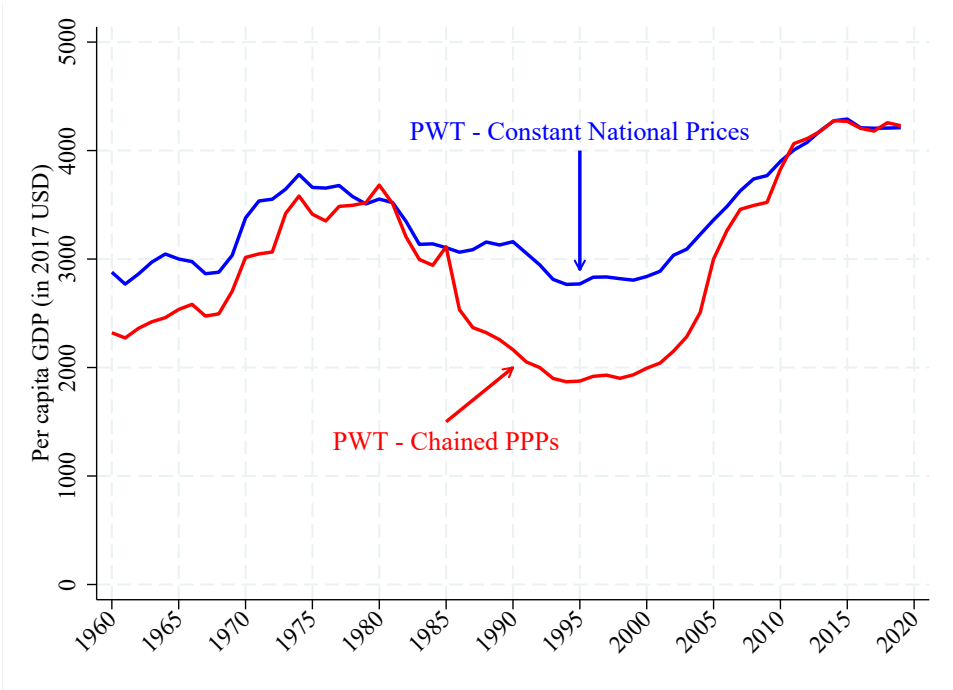
Table B9: Average Annualized Growth Rate of ODA per Capita – All Countries

Country	'80-'00	'00-'19	'80-'00 vs. '00-'19
Angola	5.5	-16.1	-21.6
Benin	2.1	1.8	-0.3
Burkina Faso	-3.4	6.8	10.2
Burundi	-3.2	6.5	9.7
Cameroon	-1.2	3.9	5.1
Central African Republic	-4.3	10.6	14.9
D.R. Congo	-7.0	12.0	19.0
Congo	-7.7	6.3	14.0
Côte d'Ivoire	-1.0	4.1	5.1
Ethiopia	2.8	7.6	4.8
Ghana	3.0	-0.2	-3.2
Guinea	0.1	4.6	4.5
Kenya	-2.0	7.2	9.2
Liberia	-4.0	8.8	12.8
Madagascar	-1.2	1.5	2.7
Malawi	2.9	2.4	-0.5
Mali	-1.8	6.8	8.6
Mozambique	6.6	0.9	-5.7
Niger	-2.0	6.6	8.6
Nigeria	5.7	13.7	8.0
Rwanda	1.5	4.4	2.9
Senegal	-0.3	3.7	4.0
Sierra Leone	2.0	3.3	1.3
U.R. of Tanzania: Mainland	-0.5	0.8	1.3
Togo	-4.2	6.9	11.1
Uganda	7.1	1.3	-5.9
Zambia	1.7	-1.9	-3.6
Zimbabwe	-1.9	7.4	9.3

Notes:

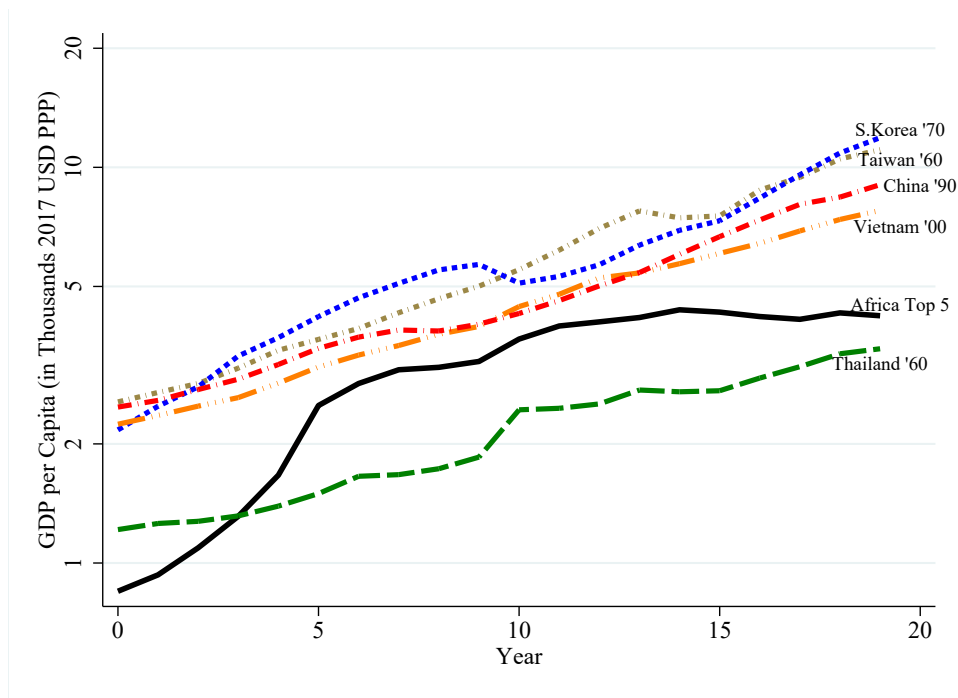
10. Appendix C: Figures

Figure C1: African per Capita GDP – Comparing Data Sources



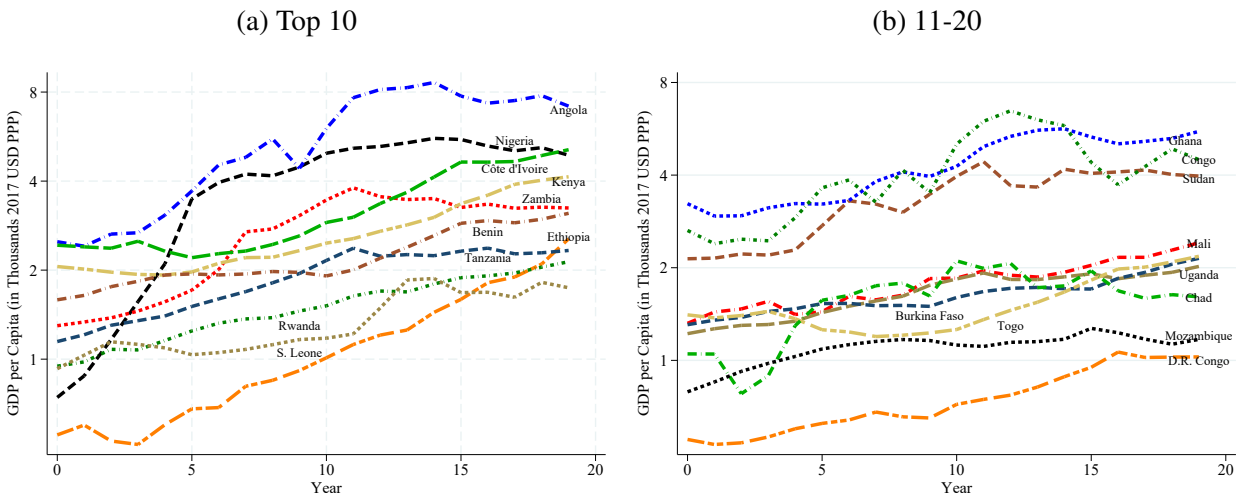
Notes: This figure shows the trajectories of Africa’s weighted average output per capita from two sources: chained PPP and constant national prices. Africa includes all countries with a population of more than 2 million in 2019 and excludes North African countries. Data collected from the PWT.

Figure C2: Early Years – Top 5 African Growers



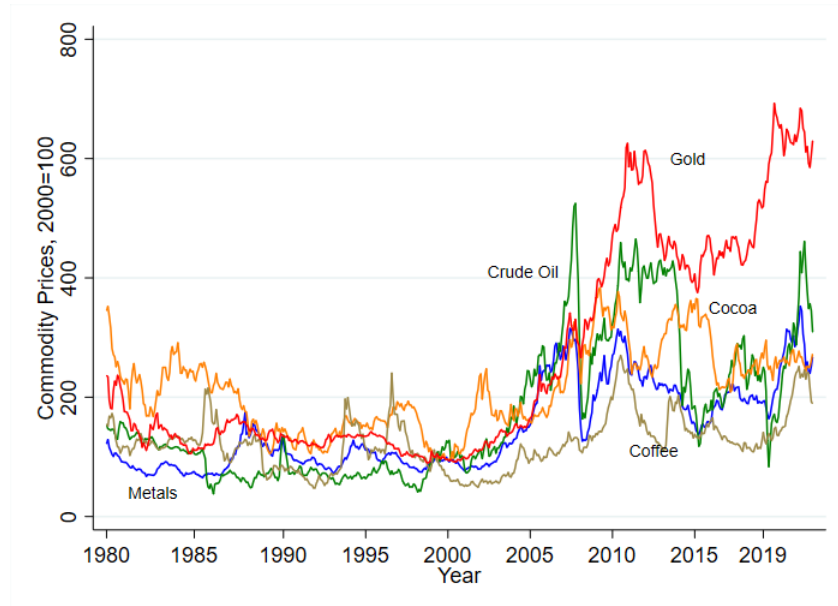
Notes: This figure shows the trajectories of output per capita of our model Asian economies and Africa weighted average for the first twenty years since the miracle started. Africa includes all countries with a population of more than 2 million in 2019 and excludes North African countries. Data collected from the PWT.

Figure C3: African Countries – Ordered by Growth Rates



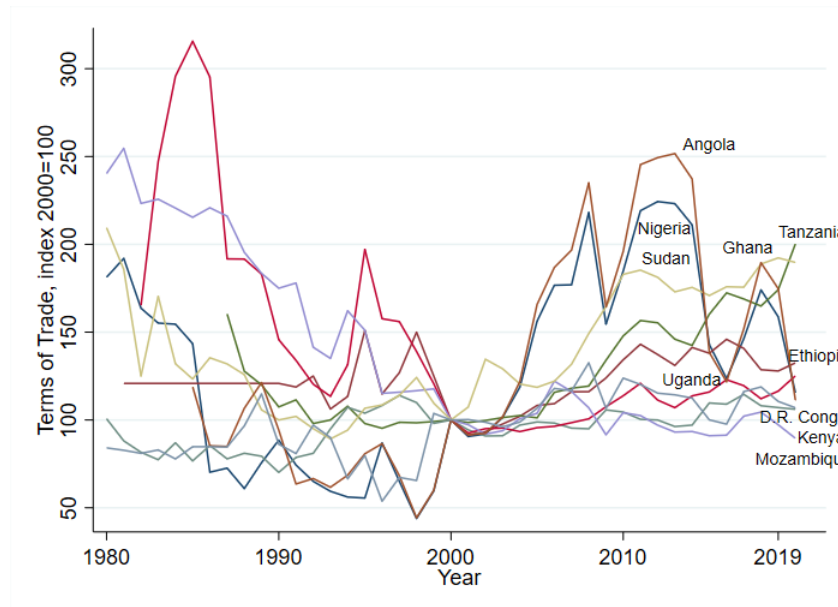
Notes: This figure shows the trajectories of output per capita of the twenty African countries which experienced the greatest growth rates during the first twenty years since the miracle started in year 2000. Gross domestic product per capita in thousands of constant 2017 international dollars. Data collected from the Penn World Table.

Figure C4: Commodity Prices



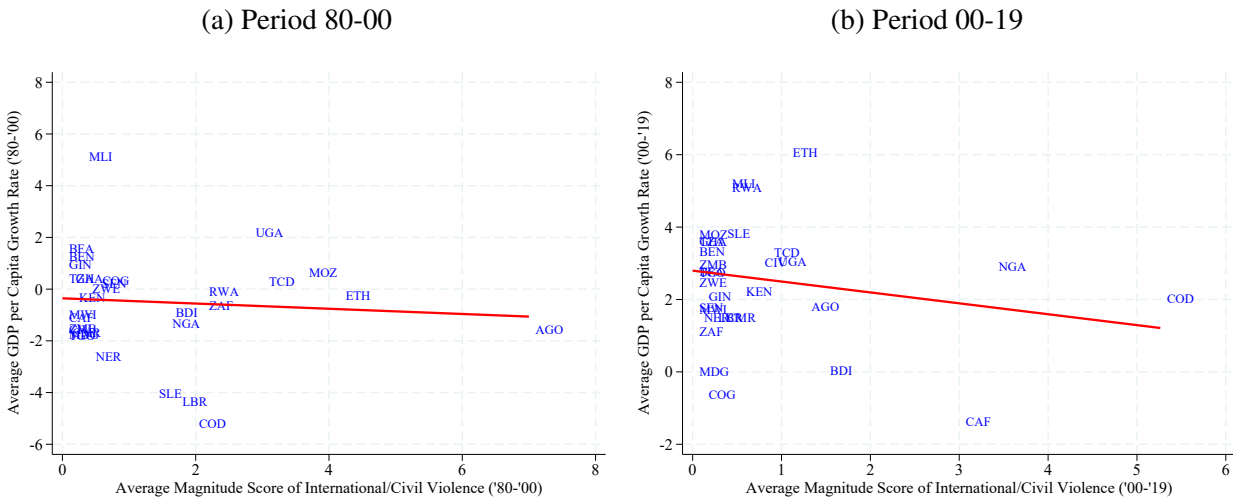
Notes: This figure displays the trajectories of commodity prices over time during the period 1980-2022. A normalization has been made for all commodities, by setting 2000=100. Data was collected from the World Bank Commodity Price Data and the Deutsche Bundesbank.

Figure C5: Terms of Trade by Country



Note: This figure displays the time series plot of normalized terms of trade (ToT) for the top ten most populous African countries during the period 1980-2020. Data on ToT was collected from the United Nations Conference on Trade and Development, Handbook of Statistics and data files, and International Monetary Fund, International Financial Statistics, both compiled from the Databank repository of the World Bank.

Figure C6: Conflict Magnitude Scores by Period (International or Civil)

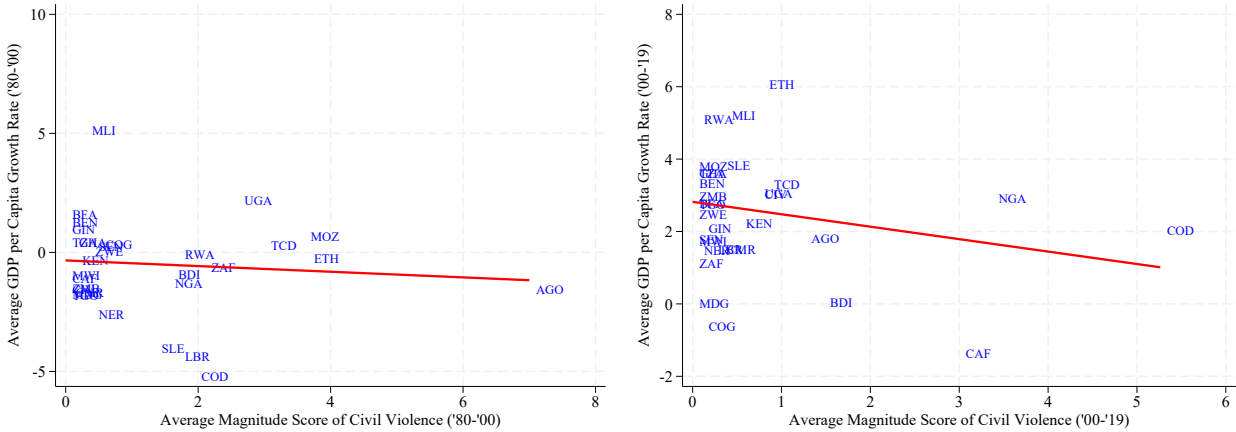


Notes: This figure plots on the vertical axis the average annualized growth rate of GDP per capita for the periods 80-00 and 00-19, and on the horizontal axis the magnitude scores of international or civil violence episodes during the same periods. Conflicts data comes from the Major Episode of Political Violence (MEPV) and Conflict Regions database, taken from the Center for Systemic Peace, CSP. Data on output per capita was extracted from the IMF. Data on population from the PWT.

Figure C7: Conflict Magnitude Scores MEPV by Period, Civil

(a) Period 80-00

(b) Period 00-19

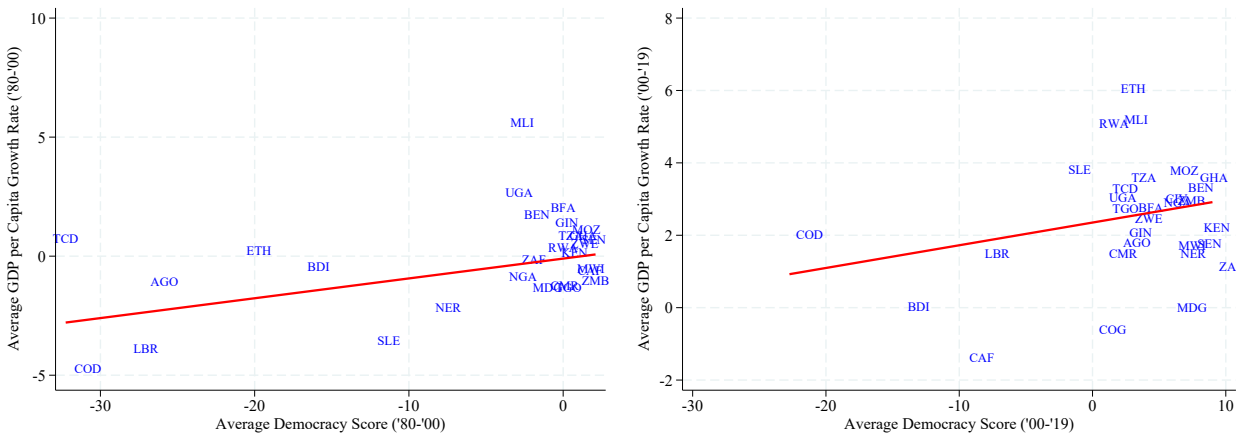


Note: This figure plots in the vertical axis the average annualized growth rate of the periods 80-00 and 00-19, and in the horizontal axis the magnitude of the score of civil violence episodes between the same periods of time. The magnitude of all civil conflicts (civil violence, civil war, ethnic violence and ethnic war) comes from the Major Episode of Political Violence (MEPV) and Conflict Regions data base, taken from the Center for Systemic Peace, CSP. Data of output extracted from the IMF. Data on population from the Penn world Table.

Figure C8: Democracy Difference by Period

(a) Period 80-00

(b) Period 00-19

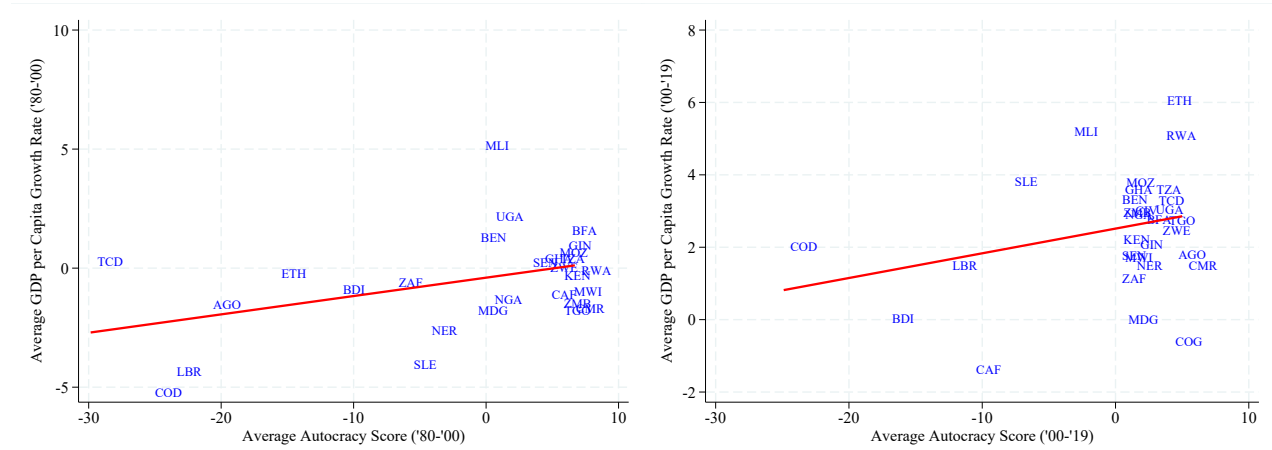


Notes: This figure plots in the vertical axis the average annualized growth rate of the periods 80-00 and 00-19, and in the horizontal axis the magnitude of the score of the democracy index between the same periods of time. The democracy index is from the Polity IV project (taken from the Center for Systemic Peace, CSP). Data of output extracted from the IMF. Data on population from the Penn world Table.

Figure C9: Autocracy Difference by Period

(a) Period 80-00

(b) Period 00-19

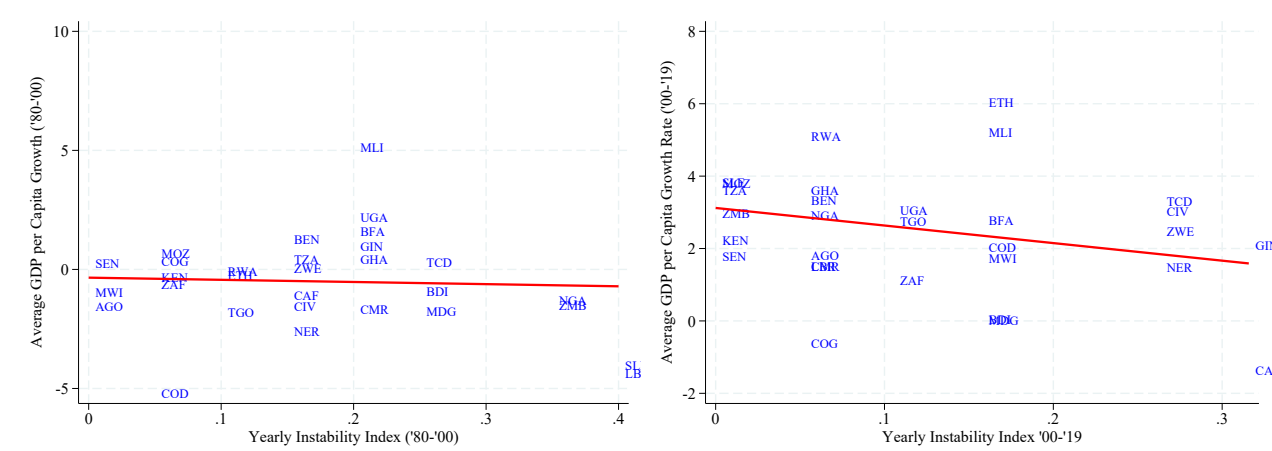


Notes: This figure plots in the vertical axis the average annualized growth rate for the periods 80-00 and 00-19, and in the horizontal axis the magnitude of the score of the autocracy index between the same period. The autocracy index is from the Polity IV project (taken from the Center for Systemic Peace, CSP). Data of output extracted from the IMF. Data on population from the Penn world Table.

Figure C10: Instability Index by period

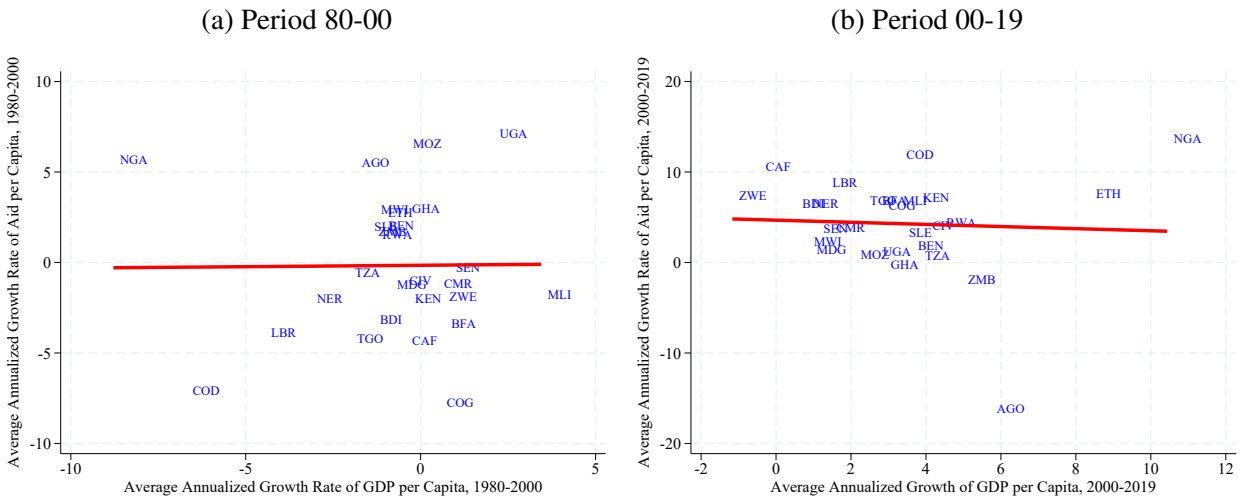
(a) Period 80-00

(b) Period 00-19



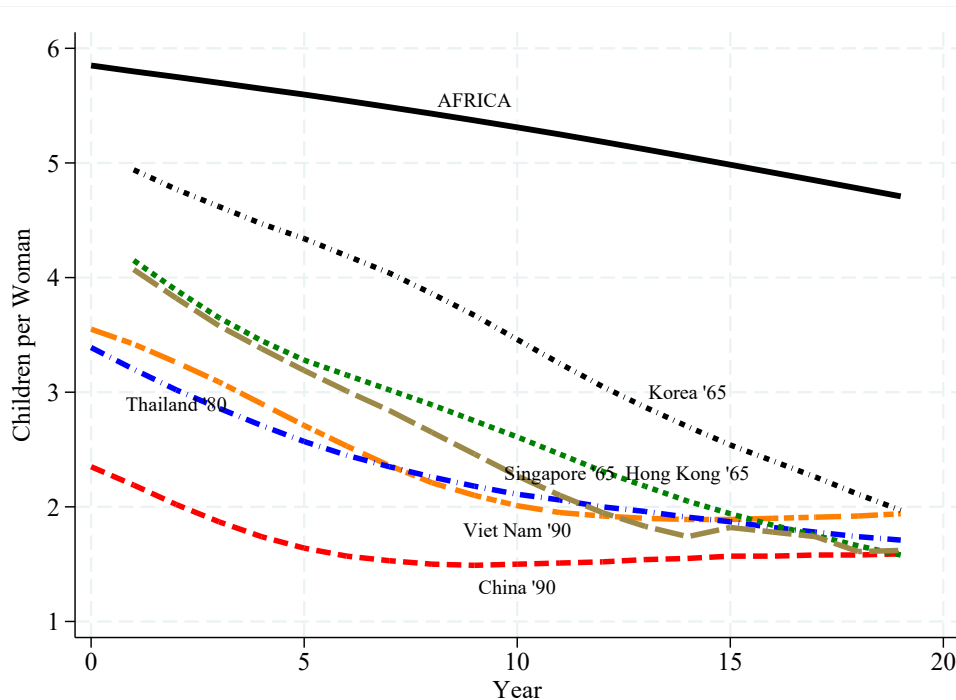
Notes: This figure plots in the vertical axis the average annualized growth rate of GDP per capita for the periods 80-00 and 00-19, and in the horizontal axis the magnitude of the instability index between the same periods of time. The instability index is Coups D'Etat Events (taken from the Center for Systemic Peace, CSP). Data of output extracted from the IMF. Data on population from the PWT.

Figure C11: Foreign Aid vs. GDP per Capita by Period



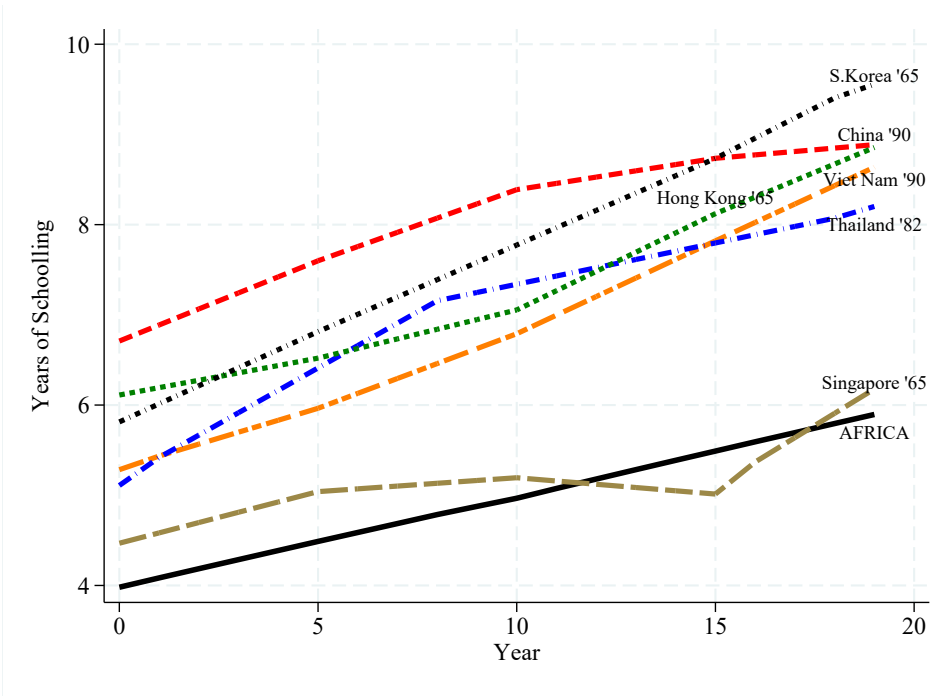
Notes: This figure plots in the vertical axis the average annualized growth rate of GDP per capita for the periods 80-00 and 00-19, and in the horizontal axis the average annualized growth rate of foreign aid per capita for the same periods of time. Aid data was taken from the World Bank. Data on output and population extracted from the PWT.

Figure C12: Fertility



Notes: This figure shows the trajectories of total fertility rate (babies per woman) of our model Asian economies and Africa weighted average for the first twenty years since the miracle started. Africa includes countries with a population of more than 2 million in 2019 and excludes the North African countries. Data from the United Nations compiled by Gapminder.

Figure C13: Years of Schooling



Notes: This figure shows the trajectories of the average years of schooling of our model Asian economies and Africa’s weighted average for the first twenty years since the miracle started. Africa includes countries with a population of more than 2 million in 2019 and excludes the North African countries. Data on population and number of workers from the Penn World Table and the BarroLee dataset.