

Khodaverdian, Saeed

Article — Published Version

The African tragedy: the effect of democracy on economic growth

Empirical Economics

Provided in Cooperation with:

Springer Nature

Suggested Citation: Khodaverdian, Saeed (2021) : The African tragedy: the effect of democracy on economic growth, Empirical Economics, ISSN 1435-8921, Springer, Berlin, Heidelberg, Vol. 62, Iss. 3, pp. 1147-1175,
<https://doi.org/10.1007/s00181-021-02049-9>

This Version is available at:

<https://hdl.handle.net/10419/286839>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>



The African tragedy: the effect of democracy on economic growth

Saeed Khodaverdian¹

Received: 17 August 2020 / Accepted: 24 March 2021 / Published online: 12 April 2021
© The Author(s) 2021

Abstract

We estimate the effect of democracy on economic growth for the countries in Sub-Saharan Africa in comparison with other countries. We find that in contrast to other countries, democracy in Africa benefits neither GDP per capita nor total GDP. We explain the former by changes in the size of the population and the latter by changes in the age structure of the population. Both demographic changes relate to the finding that unlike in other countries, democracy does not reduce child mortality in Africa. The evidence suggests that without improvements in health, democracy puts Africa on a path toward a Malthusian trap.

Keywords Africa · Development · Population growth · Age structure · Child mortality · Demographic transition · Malthusian trap

JEL codes: D7 · O10 · I15 · J1

1 Introduction

Sub-Saharan Africa (also referred to as SSA or just Africa) leads in several rankings: it is the world's poorest region, it has the fastest-growing population, and it has the worst health outcomes. Data by the World Bank show that average GDP per capita (PPP-adjusted, in constant 2011 international \$) in Africa was about 30% of the world average in 1990 (when the earliest data are available). This share has constantly decreased to only 22% in 2018.¹ This development is accompanied by fast population growth. In 1960, SSA made up about 7% of the world population. In 2018, that share

¹ The outlook for the continent is even worse. Even though extreme poverty (defined as those living with \$1.90 a day or less) has decreased worldwide, SSA remains the only region where poverty is rising. The World Bank forecasts that by 2030, almost 9 in 10 extremely poor people worldwide will live in SSA. The report is available at www.worldbank.org.

✉ Saeed Khodaverdian
saeed.khodaverdian@uni-hamburg.de

¹ Economics Dept, University of Hamburg, Von-Melle-Park 5, Hamburg 20146, Germany

has almost doubled.² Another issue is the health situation that has worsened over the last half century. In 1960, the average child mortality rate of the SSA countries was 40% higher than the global average. In 2018, it was 100% higher. In this study, we explore whether democracy provides a solution to this situation.

We estimate the within country effect of democracy on economic growth for countries in SSA. In our analysis though, we consider almost all countries in the world and the empirical model explores information for all of them in one and the same regression. As we discuss below, this method is beneficial because it enables comparisons between African and non-African countries estimated under the same econometric conditions. This approach provides deep insights for the development of Africa. Our estimation begins with fixed effects OLS estimates of the correlation between democracy and GDP per capita. The baseline estimates show evidence for a positive association. However, the positive link is significant only in the non-African countries. In the SSA countries, estimates turn out insignificant suggesting that democracy plays no important role for income growth. This pattern is supported by different measures for democracy.

The absence of significant correlation between democracy and income has to be taken with caution since the relationship is driven by endogeneity. Fixed effects models provide only some relief as they control only for the effects of those variables that are time-invariant such as geography, history, and institutions.³ However, the effects of time-variant variables remain and they can bias estimates. In addition, there is reverse causality since income is also likely to have an effect on democracy (see, e.g., Cervellati et al. (2014) and Brückner and Ciccone (2011)). We address endogeneity with two methods: first, we employ the GMM technique developed by Arellano and Bond (1991), and second, we apply an instrumental variable (IV) method based on important work by Acemoglu et al. (2019). The methods are based on different identification assumptions (we discuss them below). Yet, both techniques confirm no significant positive effect of democracy on GDP per capita in the African countries. Although none of the methods is perfect in solving the endogeneity problem, they are helpful because in sum, they draw a clearer picture of the true effect.

Figure 1 gives an illustration of the issue. It shows the development of income growth around a democratization for countries that had a single transition to democracy without a reversal to autocracy. This restriction on the countries enables to depict the development of income before and after a democratization. As can be seen, both groups of countries experience some growth from a democratization. However, the gains are not significant for the SSA countries. The empirical analysis confirms this conclusion.

We also estimate the effect of democracy on total GDP. This is an important step because it provides insight how democracy affects GDP per capita. These estimates show that no countries' GDP benefits from democracy. When democracy does not support total GDP but it increases GDP per capita in the non-African countries, the denominator of GDP per capita has to play an important role. We explore this theory by estimating the effect of democracy on the size of the total population. The estimates

² Reports by the UN forecast that SSA will more than double its population from 926 million people today to nearly 2.2 billion in 2050. This is more than half of global population growth. By that time, SSA will represent 25% of the global population. The report is available at www.worldbank.org.

³ For geography, see, e.g., Bloom et al. (1998), for history see, e.g., Nunn (2007), and for institutional factors see, e.g., Asiedu (2002) and Dalgaard et al. (2004).

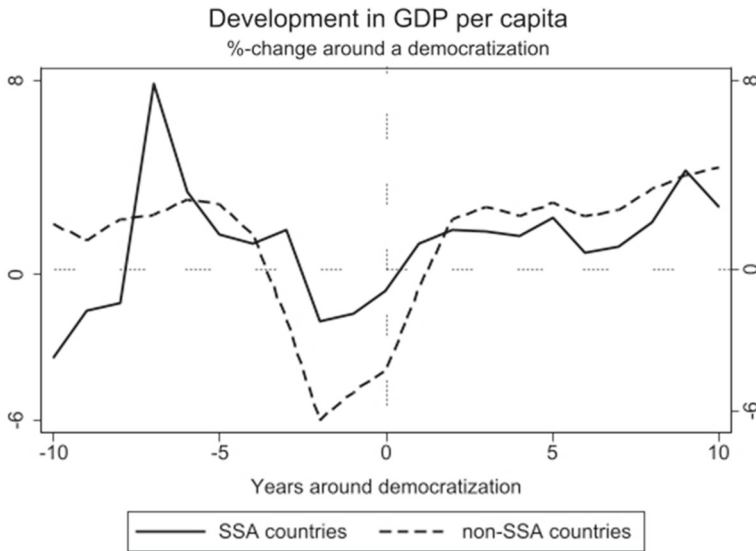


Fig. 1 Average %-change in GDP per capita around a democratization only for the countries that had a single transition from autocracy to democracy without a reversal. The identification of a transition is based on the dichotomous measure for democracy provided by Acemoglu et al. (2019). More information is given in Sect. 2

reveal an interesting pattern as they show that democracy has a decreasing effect on the population size in the non-African countries whereas in the African countries, it has an increasing effect on the total size. The relationship between population size and economic growth is the subject of a large body of work that has not concluded yet. On the one hand, a larger population means more people, i.e., brains that are more likely to develop advanced technology thus leading to more income growth. On the other hand however, the famous Malthusian theory postulates a negative effect since the contribution of each additional labor unit decreases due to limited resources (see Peterson (2017) for a discussion of the literature). Against this background, we explore how democracy affects the age structure of the population.⁴ The estimates show that democracy decreases the share of young population (age 0–14 years) in the non-African countries whereas it increases that share in the African countries.

This finding provides an explanation why democracy does not benefit income growth in Africa. Albeit, it also raises the question about the reason why the demographic figures react so differently to democracy? We find evidence for an explanation related to child health since democracy shows not to improve the child mortality rate in the African countries. In the non-African countries though, democracy leads to significant improvements. Figure 2 provides some illustrative support for this explanation. It shows the development of the child mortality rate for those countries that had a single democratization without a reversal to autocracy. The runs show that in the non-SSA

⁴ Age structure is an important determinant of economic growth. This view is shared by both traditional Solow-model-based growth accounting and more recent endogenous growth models (see, e.g., Becker (1962) and Ben-Porath (1967)). The argument therein is that savings rates and human capital accumulate over the life cycle.

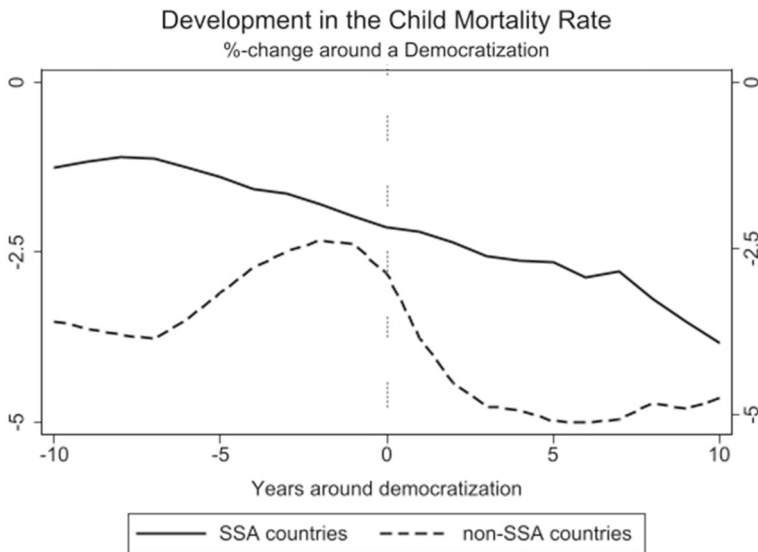


Fig. 2 Average %-change in the child mortality rate around a democratization only for the countries that had a single transition from autocracy to democracy without a reversal. The identification of a transition is based on the dichotomous measure for democracy provided by Acemoglu et al. (2019). More information is given in Sect. 2

countries, mortality decreases significantly after a democratization. However, in the SSA countries, a transition to democracy is shown to have no distinct effect on the health condition of children. The rate decreases in an almost linear way casting doubt as to whether the regime change plays any important role.

Although we cannot rule out alternative explanations, the evidence suggests that since democracy has no beneficial effect on child health in Africa, it leads to a larger share of young people in the population.⁵ The youth in turn represent a less productive part of the labor force. Thus, their contribution to economic performance is relatively small, if any. Consequently, democracy shows to have no significant effect on total GDP. At the same time, democracy shows to increase the size of the total population. In combination with no significant effects on total GDP, the pattern explains why democracy has no beneficial effect on GDP per capita in the African countries.

Our key contribution is the mechanism through which democracy affects GDP per capita. Existing research highlights channels such as investment, education, and trade (see, e.g., Papaioannou and Siourounis (2008) and Acemoglu et al. (2019)). We add the size of the total population to this list. As our estimates show, in the non-African countries, democracy leads to more GDP per capita not because it increases total GDP but because it decreases the total headcount. Both empirical (e.g., Acemoglu and Johnson (2007)) as well as theoretical contributions (e.g., Galor and Weil (2000))

⁵ The link between mortality rates and the share of young people is based on seminal contribution by Becker (1960) postulating that when mortality rates are high, parents prefer many children. They do so to compensate that some of their newborns will not survive into adulthood. Otherwise, when mortality rates are low, parents prefer fewer children with high investment in them.

have shown that fast population growth can prevent sustained rise in GDP per capita. Africa is particularly affected by this issue because of its fast population growth rate. Since democracy supports that growth, in its current version, democracy is unlikely to help the SSA countries out of the poverty trap.⁶

2 Data and empirical framework

2.1 Data

We utilize data from different sources. The first category of data concerns information for the political situation in the countries. To this end, we collect data from the Polity IV Project (Marshall et al. (2017)) that includes the Polity 2 index of democracy. The index is a revised 21-scale measure that gauges democracy on the basis of competitiveness of executive recruitment, openness of executive recruitment, constraints on the chief executive, regulation of participation, and competitiveness of participation. The Polity 2 index is meaningful because it measures democracy on multiple intermediate stages ranging from absolute autocracy (−10) to pure democracy (+10). Due to this feature, we refer to it as the continuous measure for democracy. We follow the literature by normalizing the index to range between 0 (absolute autocracy) and 1 (pure democracy). Next to it, we employ the democracy measure by Acemoglu et al. (2019). The authors review numerous existing sources constructing a consolidated index that takes either value 0 (absolute autocratic) or value 1 (pure democratic). Due to its two-stage feature, we refer to the index as the dichotomous measure for democracy. Each measure has advantages and disadvantages. The continuous one reacts to all changes that concern the political process. This feature is disadvantageous when changes do not reflect meaningful changes in democratic institutions. The dichotomous measure in turn is more robust since it is not prone to such noises in the data. However, since it includes less information, it is also less variable. We employ both measures to show the robustness of our findings.

The second source for our data is the World Development Indicators (WDI) database maintained by the World Bank. The database includes information for GDP per capita (at constant 2000 US\$), size of the total population, share of population in the age of 0–14 years, and child mortality rate (per 1,000 births). We use the information on the former two measures to calculate total GDP (= GDP per capita * total population). This approach guarantees that we have the same sample for GDP per capita and total GDP (since information for total population is not missing).

Finally, we utilize the instrument for democracy as given by Acemoglu et al. (2019). The instrument implements the idea that political processes across countries affect each other (Huntington (1991) speaks of “waves of democracy” in that matter). Thus, for a given country, the average democracy score of other countries serves as exogenous variation in democracy. Acemoglu et al. (2019) refine this idea by considering the

⁶ We are not the first to attest a growth tragedy for Africa (see, e.g., Easterly and Levine (1997); Collier and Gunning (1999), and Artadi and Sala-i Martin (2003)). However, most of the theories brought forward by these studies are endogenous to economic growth (as discussed by Collier and Gunning (1999)). Our analysis sheds more light on the issue as we tackle numerous estimation biases.

average democracy score only of those countries that are in the same geographical region (as defined by the World Bank) and that have similar political history. The authors show that the so-constructed instrument is a powerful predictor of democracy. We refer to the instrument as the ANRR-IV.

Overall, our data set includes annual information for up to 175 countries of which 45 are in SSA. The period of analysis is 1960–2010. However, the data set is unbalanced meaning that not all data are given for all countries at any time. Table 3 in “Appendix” provides summary statistics for all the variables employed. It shows that in comparison with the non-SSA countries, the SSA countries are on average poorer (GDP per capita), younger (share of population between 0 and 14 years), and have much worse health conditions (children mortality rate).

2.2 Empirical framework

Our regressions are based on the following dynamic model:

$$y_{ct} = \beta D_{ct} + \sum_{j=1}^p \gamma_j y_{ct-j} + \alpha_c + \delta_t + \varepsilon_{ct}. \quad (1)$$

This equation regresses (the log of) income y_{ct} on democracy D_{ct} for country c at time t .⁷ According to the literature (Acemoglu et al. (2019) and Brückner and Ciccone (2011)), changes in the political process are preceded by economic fluctuations. This dynamic is controlled by including p lags of income on the right hand of the model. The other factors in the equation are a full set of country fixed effects α_c that absorb the effects of any time-invariant country characteristics, and a full set of year fixed effects δ_t that capture the effects of any time-variant shocks that are common across the countries in the sample. The error term ε includes all other time-varying unobservable shocks to income. Throughout the analysis, reported standard errors are robust against arbitrary heteroskedasticity and serial correlation at the county level.

Equation (1) represents the standard model to estimate the average effect of democracy on income for a given sample of countries. We can apply it to two different samples of countries (African and non-African). Although intuitive, this approach is not beneficial. By excluding one group from regressions, not all variation in the sample is exploited. In this case, estimates are sensitive to the number of observations in the group (recall that there are only 45 African countries in the sample compared to 130 non-African countries). Moreover, the samples are not estimated under the same (econometric) assumptions since the year fixed effects differ across them. As mentioned above, these effects reflect those time-variant shocks that are common across the countries in the sample. Thus, for different samples, the year fixed effects differ as well. In no case though, do they capture global shocks.

⁷ Note that y_{ct} refers to the level of income. Since this measure is log-transformed, the estimates in the tables below can be interpreted as %-changes (or growth).

For these reasons, we modify the standard model to a partially interacted model:

$$y_{ct} = \beta_g D_{ct} + \beta_m (D_{ct} * SSA_c) + \sum_{j=1}^p \gamma_j y_{ct-j} + \alpha_c + \delta_t + \varepsilon_{ct}. \quad (2)$$

This equation is a general version of Eq. (1). It differs by an interaction term between democracy and a country-specific dummy SSA_c taking value 1 if country c is in the SSA region and 0 otherwise. The understanding of the model is that it estimates the effect of democracy on income in two terms. The first one estimates the effect of democracy that is common across all countries. We highlight this part of the effect by a subscript g clarifying that it represents the *general* effect of democracy (β_g). The second term identifies the *marginal* effect of democracy (subscript m) that exists only in countries where $SSA_c = 1$. When $SSA_c = 0 \forall c$, the partially interacted model overlaps with the standard model as in Eq. (1). Otherwise, the effect of democracy results from the accumulation of the first two terms. This can be seen better when we rearrange Eq. (2) as follows:

$$y_{ct} = (\beta_g + \beta_m * SSA_c) D_{ct} + \sum_{j=1}^p \gamma_j y_{ct-j} + \alpha_c + \delta_t + \varepsilon_{ct}.$$

This version clarifies that for the non-African countries (where $SSA_c = 0$), β_g shows the effect of democracy on income. For the African countries (where $SSA_c = 1$), the addition of general and marginal effects shows the cumulative effect of democracy on income. In this way, we exploit all variation in the sample. Moreover, the time fixed effects do not differ across the groups. This model enables fair comparisons across African and non-African countries since effects are estimated under the same econometric conditions (see Cervellati et al. (2014) for the same approach).

3 Main results

Table 1 shows estimates of the association between democracy and economic performance. We begin by estimating Eq. (2) with common panel estimators including fixed effects OLS, Arellano–Bond GMM (Arellano and Bond (1991)), and IV based on the ANRR-IV instrument. With each method, we employ the continuous and dichotomous measure for democracy in alternate order. Moreover, the table shows estimates in two separate panels: in Panel A, the outcome variable is (log) GDP per capita and in Panel B, we measure income by (log) GDP. As discussed above, the model includes several lags of income to control for the dynamics that proceed changes in the political process. The specifications presented here include four lags of the respective income measure. Tables 4–6 in “Appendix” clarify that higher lags are irrelevant (as in Acemoglu et al. (2019)). To keep clear overview, we do not report the lags in Table 1. Instead, we show

Table 1 Estimates of the association between democracy and economic growth

Estimator	Fixed effects OLS		Arellano-Bond GMM		ANRR - IV	
	Continuous (1)	Dichotomous (2)	Continuous (3)	Dichotomous (4)	Continuous (5)	Dichotomous (6)
Democracy	0.231 (0.438)	1.174*** (0.278)	0.672 (0.639)	1.116*** (0.415)	1.768* (0.935)	1.172** (0.582)
Democracy × SSA	-1.716*** (0.755)	-1.087*** (0.368)	-2.025** (0.950)	-0.938 (0.618)	-4.457*** (1.509)	-3.538** (1.492)
Cumulative Effect for SSA	-1.485** (0.671)	0.087 (0.312)	-1.353* (0.794)	0.177 (0.521)	-2.688 (1.837)	-2.366 (1.712)
Persistence of the growth process	0.964*** (0.005)	0.962*** (0.005)	0.954*** (0.006)	0.946*** (0.008)	0.962*** (0.006)	0.959*** (0.006)
Observations	5,646	6,336	5,491	6,161	5,635	6,312
R ²	0.977	0.976				
AR(2) test <i>p</i> value			0.444	0.614		
1st-stage F-statistics					24.7	9.4
Countries in sample	153	175	153	175	152	174

Table 1 continued

Estimator	Fixed effects OLS		Arellano–Bond GMM		ANRR - IV	
	Continuous (1)	Dichotomous (2)	Continuous (3)	Dichotomous (4)	Continuous (5)	Dichotomous (6)
Panel B: (log) GDP						
Democracy	-0.339 (0.512)	0.732*** (0.248)	0.327 (0.839)	1.120*** (0.419)	1.190 (0.895)	0.843 (0.556)
Democracy × SSA	0.116 (0.746)	0.0192 (0.329)	-0.448 (1.059)	-0.345 (0.632)	0.233 (1.331)	0.664 (1.250)
Cumulative Effect for SSA	-0.223 (0.603)	0.751** (0.306)	-0.121 (0.709)	0.775 (0.520)	1.423 (1.610)	1.507 (1.438)
Persistence of the growth process	0.964*** (0.004)	0.962*** (0.005)	0.951*** (0.007)	0.947*** (0.010)	0.965*** (0.004)	0.962*** (0.005)
Observations	5,646	6,336	5,491	6,161	5,635	6,312
R ²	0.990	0.989				
AR(2) test <i>p</i> value			0.587	0.516		
1st-stage F-statistics					29.1	11.2
Countries in sample	153	175	153	175	152	174

Note The table shows estimates of the correlation between and the one-sided effect of democracy on economic growth. The estimators are named at the top of the table. Democracy is measured by two distinct indices named in the second-top row. The continuous measure is the normalized Polity 2 index (Marshall et al. (2017)) and the dichotomous measure is from Acemoglu et al. (2019). The measures for economic growth are named at the top of each panel. Democracy measures the general effect of democracy that applies to all countries in the sample. The interaction term between democracy and SSA estimates the marginal effect of democracy that applies only to the SSA countries. The addition of general and marginal effect determines the cumulative effect of democracy for the SSA countries (see also Eq. (2)). Persistence of the growth process informs about the joint significance of the first four lags of the corresponding growth measure (see Tables 4–6 in “Appendix” for alternative lag structures). Standard errors robust against heteroskedasticity and serial correlation at the country level are given in parentheses. Significance levels are ***p*<0.01, ****p*<0.05, **p*<0.1

a summary statistic (persistence of the growth process) that informs about the joint significance of the lags of the corresponding measure for economic growth.⁸

Column (1) in Panel A shows a coefficient of 0.231 (with standard error 0.438) for the general correlation between the continuous measure for democracy and GDP per capita. For the non-African countries, this estimate suggests that there is no significant relationship between democracy and income growth. For the African countries, the coefficient of the marginal effect is -1.716 (0.755). The negative sign clarifies that it offsets the general effect of democracy leading to a cumulative effect of -1.485 . In sum, the cumulative effect suggests that democracy and income growth are negatively correlated in the SSA countries. The coefficient is precisely estimated (the standard error term is 0.671) clarifying that the negative link is significant at the 95% level. The specification in column (2) shows a similar pattern. Therein, democracy is measured by a dichotomous index. The coefficient for the general correlation is 1.174 with a small error (0.278) making it significant at the 99% level. Yet, the marginal effect is -1.087 . Since this coefficient is almost identical in size and negative in sign, the cumulative effect for the SSA countries turns out to be marginal with 0.087. Moreover, the large error term (0.312) makes the coefficient statistically insignificant. Taken together, the correlation analyses provide a first indication that the relationship between democracy and GDP per capita follows a different path in the African countries compared to the non-African countries.

The OLS estimator suffers from the issue that democracy is not strictly exogenous to income. The GMM estimator developed by Arellano and Bond (1991) tackles the issue by constructing internal instruments. Under the condition of no serial correlation in the error term, higher lags of the endogenous variable can be used as its own instruments. The estimates in columns (3) and (4) are based on this method. To show the validity of the GMM estimation technique, we report p values for the AR(2) test of serial autocorrelation at the bottom of the columns. In both cases, the assumption of serial correlation is clearly rejected. In terms of the effect of democracy on GDP per capita, the GMM coefficients differ to some extent from the OLS estimates. In column (3), for example, the general effect of democracy on income is 0.672. This is about three times as large as the OLS estimate in column (1). The estimate in column (4) deviates from that in column (2) by showing that the marginal effect of democracy is not statistically significant. However, in terms of conclusion, both specifications confirm that democracy does not support income growth in the African countries. This is clarified by estimates for the cumulative effect that are either significantly negative (column (3)) or insignificant (column (4)).

Although powerful, the GMM estimator cannot solve the entire endogeneity problem. A particular issue is time-varying autocorrelated omitted variables that are also correlated with democracy and that have delayed effects on income, e.g., education. In the presence of such variables, GMM estimates mix the effect of democracy with the effects that such variables have on the outcome variable. The IV estimator can overcome this issue when external instruments are applied. These are exogenous sources that affect democracy (relevance criterion) without having a direct effect on

⁸ Note that high persistence of the growth process can be identified by an autocorrelation coefficient close to unity. As the summary statistics show, this is always given here.

the outcome variable (exclusion restriction). The former condition can be tested by the 1st-stage F-statistics where a value ≥ 10 indicates that the IV bias is smaller than that of the corresponding OLS estimator. With respect to the exclusion restriction though, there is no econometric test to confirm the validity of the instrument. It is rather based on economic reasoning. Acemoglu et al. (2019) present numerous specifications showing that their instrument is exogenous to several theories that have the potential to violate the exclusion restriction.

In columns (5) and (6), we present second-stage IV results where democracy is instrumented by the first lag of the ANRR-IV. To save space, the corresponding first-stage results are shown in Table 7 in “Appendix.” Several findings emerge for the second-stage results. First, with the continuous measure for democracy, column (5) shows that the general effect of democracy on income is significant. The estimates in columns (1) and (3) are insignificant (and much smaller in magnitude). An addition, the marginal effect is more than twice as large in magnitude as the previous specifications. This leads to an even larger negative cumulative effect of democracy on income in the SSA countries, 2.688. However, it is imprecisely estimated (error term 1.837) making the coefficient statistically insignificant.

Second, with the dichotomous measure for democracy, column (6) shows that while the estimate for the general effect of democracy is comparable to the estimates in columns (2) and (4), the coefficient for the marginal effect in the SSA countries is more than three times larger in magnitude than the corresponding estimates in columns (2) and (4). This leads to a negative cumulative effect that is also much larger in magnitude than the previous estimates. In any case, the cumulative effect for the SSA countries is still negative and statistically insignificant.

Third, when comparing the different estimators to each other, it turns out that the IV estimates of the cumulative effects are much closer to each other than the estimates of the other methods. This increases confidence in the precision of the IV method. The 1st-stage F-statistics of 24.7 and 9.4 provide further support.⁹ Each of the estimation methods has disadvantages.¹⁰ Yet, they all suggest that democracy does not support GDP per capita in the African countries.

Panel B repeats the exercises of Panel A using (log) GDP as measure for economic performance. Most of the estimates question a significantly positive effect of democracy on income for both groups of countries. For the non-SSA countries, the estimates in columns (1), (3), and (5) suggest that there is neither significant correlation nor evidence for a positive effect of democracy on income when the spectrum of the polit-

⁹ In column (6), the 1st-stage F-statistics is slightly below the value of 10. This is probably related to the fact that we instrument a dichotomous democracy measure by a continuous instrument. The different patterns in the measures lead to lower correlation. In column (5), this issue does not apply because both measures are continuous. To remedy this issue, we experimented with additional lags of the instrument (Acemoglu et al. (2019) employ the first four lags). This led to weaker 1st-stage F-statistics: 4.8 when the second lag was added, 3.2 when the second and third lags were added, and 2.6 when the first four lags were employed. All specifications though showed no significant effect of democracy on GDP per capita in the SSA countries. These results are not shown here but they are available.

¹⁰ The OLS estimator, for example, suffers from endogeneity thus not being able to identify causal effects. The GMM estimator provides some relief. However, it is based on internal instruments. As mentioned above, it is prone to time-varying autocorrelated omitted variables. The IV approach can solve the endogeneity problem. However, a violation of the exclusion restriction cannot be excluded entirely.

ical process is measured by a continuous index. This pattern is confirmed by all three estimation techniques. When democracy is measured by a dichotomous index though, the OLS and GMM estimators in columns (2) and (4) show significantly positive coefficients. However, the IV estimate in column (6) turns out insignificant (p value 0.130, not shown in the table).¹¹ For the group of the SSA countries, all estimates for the marginal effect of democracy are insignificant. Consequently, most of the estimates for the cumulative effect are also insignificant. The only exception is the coefficient for the correlation between democracy and GDP in column (2).

When comparing the estimates in Panel A to each other, there are many potential explanations for the divergent development path in the African countries. The pool of potential explanations however, can be reduced when comparing the estimates of Panel A to those of Panel B. Despite the correlation analyses in columns (1) and (2), the estimates in Panel A indicate that there is a positive causal effect of democracy on income growth in the non-SSA countries. The estimates in Panel B question this effect even for the non-African countries. The two panels differ only by the fact that one of them takes into account the size of the population while the other does not. This distinction represents a good starting point for the investigation of an explanation.

4 Explanations for no economic growth in Africa

In this section, we aim at providing an explanation for the pattern shown in Table 1. There, the evidence suggests that the denominator of GDP per capita plays an important role in explaining why democracy does not lead to more economic growth in the African countries. Thus, we begin by exploring how democracy affects the size of the total population. To this end, we modify Eq. (2) as follows: First, we replace the left-side variable by a demography figure as mentioned below. Second, we augment the right side of the equation by the first four lags of the respective figure (summarized in the table as persistence of the outcome variable). Third, we keep the first four lags of (log) GDP per capita as controls in order to exclude the effect of economic growth. The statistics for the growth process are not reported in the table.

Table 2 displays the estimates. Therein, democracy is measured by the continuous index. The estimates with the dichotomous measure led to the same qualitative results (see Table 8 in “Appendix”). Columns (1) to (3) show the association between democracy and (log) population size. The specifications differ only by the estimation method (as mentioned beneath the outcome variable). All three estimators show that democ-

¹¹ The most likely explanation for this pattern is related to the estimation assumptions that differ across the estimation techniques. The exclusion restriction of the IV method, for example, assumes that conditioned on the lags of GDP, political events in neighboring countries have no direct effect on current GDP. The lags of GDP account for potential violations. However, it is possible that foreign political events have effects on current GDP that are not captured by its lags. We explored this possibility by controlling for the change in mortality rates. The health conditions of refugees that flee political turmoil may be worse than that of local citizens. This can have direct effects on GDP. The estimates we observed reject this theory (not shown here but available).

Table 2 Estimates of the association between democracy (continuous) and growth-related channels

Outcome variable Estimator	log Population size			Population structure (share 0–14 years)			log Child Mortality Rate		
	OLS (1)	GMM (2)	IV (3)	OLS (4)	GMM (5)	IV (6)	OLS (7)	GMM (8)	IV (9)
Democracy	-0.0913** (0.0360)	-0.0746 (0.0519)	-0.229*** (0.0890)	-0.0435*** (0.0102)	-0.0530*** (0.0146)	-0.0729*** (0.0305)	-0.438*** (0.114)	-0.460*** (0.138)	-1.313*** (0.295)
Democracy × SSA	0.301*** (0.0797)	0.290*** (0.0943)	0.644*** (0.203)	0.0812*** (0.0186)	0.0994*** (0.0249)	0.193*** (0.0466)	0.312* (0.175)	0.332 (0.202)	1.056*** (0.399)
Cumulative Effect for SSA	0.209*** (0.071)	0.216*** (0.079)	0.415** (0.196)	0.038** (0.016)	0.046** (0.021)	0.120** (0.056)	-0.127 (0.150)	-0.128 (0.166)	-0.256 (0.424)
Persistence of outcome variable	0.997*** (0.001)	0.997*** (0.001)	0.997*** (0.001)	0.989*** (0.001)	0.986*** (0.002)	0.987*** (0.001)	0.992*** (0.001)	0.991*** (0.002)	0.991*** (0.002)
Observations	5,654	5,499	5,643	5,654	5,421	5,643	5,426	5,273	5,415
R ²	1.000			0.999			0.999		
AR(2) test <i>p</i> value		0.984			0.674			0.391	
1st-stage F-statistics			24.9			21.6			17.1
Countries in sample	153	153	152	153	153	152	151	151	150

Note The table shows estimates of the correlation between and the one-sided effect of democracy on three growth-related channels named at the top of the table. Democracy is proxied by the normalized continuous measure (Polity 2). Table 8 in “Appendix” shows the outcome when democracy is proxied by the dichotomous measure. The estimators are mentioned at the second-top row. Democracy measures the general effect of democracy that applies to all countries in the sample. The interaction term between democracy and SSA estimates the marginal effect of democracy that applies only to the SSA countries. The addition of general and marginal effect determines the cumulative effect of democracy for the SSA countries (see also Table 1 and Eq. (2)). Persistence of the outcome process informs about the joint significance of the first four lags of the outcome variable. All specifications control for the first four lags of (log) GDP per capita (not displayed in the table). Standard errors robust against heteroskedasticity and serial correlation at the country level are given in parentheses. Significance levels are * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

racy has a decreasing effect on the population size in the non-African countries.¹² This is clarified by estimates of -0.09 , -0.07 , and -0.23 , all negative in sign. Only with the GMM estimator is the coefficient not significant (p value is 0.151, not shown in the table). For the African countries in turn, the marginal effect of democracy is positive and highly significant in all three cases (see Table 10 in “Appendix” for the first-stage results of the IV specifications). Since the marginal effects are all larger in magnitude than the associated estimates for the general effects, estimates of the cumulative effect of democracy on population size turn out positive suggesting that democracy increases the headcount in the African countries. This result is the opposite of what happens in the non-African countries and it provides an explanation for the heterogeneous effect of democracy on GDP per capita across the African and non-African countries.

Larger populations are not necessarily an obstacle to income growth. The effect depends on how the additional units contribute to economic performance. The estimates in columns (4) to (6) shed some light on this question as they show how democracy affects the age structure of the population. In detail, we estimate the effect of democracy on the %-share of population that is 0–14 years. Again, it turns out that there is meaningful heterogeneity across the two groups of countries. In the non-African countries, democracy decreases the share of young population. This is shown by the coefficient of the general effect of democracy that is significantly negative with all three estimators. In the African countries in turn, the effect is reversed due to marginal effects that are all positive and larger in magnitude. This leads to cumulative effects that are significant and positive. In sum, these estimates suggest that democracy decreases the share of young people in the non-African countries but increases that share in the SSA countries. This pattern explains why democracy does not support total GDP growth in Africa.

Finally, the question remains why Africa’s demography figures show this picture. We explore this issue by estimating the effect of democracy on (log) child mortality rate. The estimates in columns (7) to (9) provide an interesting pattern as they show that democracy decreases the child mortality rate only in the non-African countries. In the SSA countries though, the marginal effect is positive suggesting that democracy’s effect on child mortality follows a different path in Africa. Although the magnitudes of the marginal effects are smaller than those of the general effects, they are large enough to offset the general effects such that the cumulative effect of democracy on the child mortality rate turns out insignificant in Africa. This pattern is confirmed by all three estimators.

¹² Note that in column (1), the R-square term is 1. This questions whether the stationary assumption is still valid. Controlling for the dynamics of the outcome variable is important because as shown by Acemoglu et al. (2019), countries undergo certain developments in expectation of a democratization. The lags account for this issue. Still, in Table 9 in “Appendix,” we address this issue for all the OLS specifications shown in Table 2. In detail, we successively reduce the number of lags of the outcome variable. Only in two cases (columns (11) and (12) in Table 9) do the results differ from those shown in Table 2. The former suggest that democracy is negatively correlated with the child mortality rate in Africa, and the latter shows even a positive correlation. Both specifications are critical since they do not sufficiently model the dynamics of the outcome variable. The table displays the coefficients to clarify this issue. As shown in columns (9) and (10), higher lags are significant and hence have to be included in the model. Note that the specification in column (9) in Table 2 controls for four lags of mortality. Even the fourth lag is significant (not shown here but available).

In sum, the specifications in Table 2 provide an explanation why democracy does not lead to more economic growth in the SSA countries. The evidence draws a line from poor health to changes in demographic figures that affect economic growth. We are not aware of exogenous variation in the demographic figures. This complicates the analysis of the causal effects that these factors have on growth. However, in Table 11 in “Appendix,” we provide some insights. In detail, we employ the OLS and GMM estimator exploring the effects that total population size and the share of young people have on GDP per capita. The estimates too show a heterogeneous pattern across the SSA and non-SSA countries. In detail, they show that an increase in the population size has negative effects on growth only in the SSA countries. Outside of that region, the effect is insignificant. The share of young population in turn has negative effects on GDP per capita only in the non-SSA countries (note that this share decreases due to democracy). In the SSA countries, that share has no significant effect on GDP per capita. This confirms the suggestion that the youth do not contribute to growth in Africa. This pattern has important policy implications.

5 Conclusion

The question whether or not the political orientation of a country matters for economic performance is of central interest to the political economy literature. In this study, we explore this issue for the countries in Sub-Saharan Africa in comparison with other countries. Regression analyses show that unlike in the non-African countries, democracy has no significantly positive effect on GDP per capita in the African countries. We show that heterogeneous effects of democracy on the size and age structure of the African populations explain the different development paths. The demographic changes in turn are related to the finding that democracy fails to reduce the child mortality rate in the African countries. In the non-African countries though, democracy is shown to significantly improve the child mortality rate. Taken together, the analysis shows that democracy does not support income growth in the African countries because it does not support a demographic transition.¹³

Future research may want to explore in more detail why democracy does not have the same pro-health effect on child health in Africa than elsewhere.¹⁴ A famous branch of the literature argues that this is related to the continent’s geographical position that is more prone to tropical diseases than other regions of the world (see, e.g., Sachs and

¹³ The demographic transition refers to significant changes in mortality and fertility rates that determine the size of the total population. Western Europe is the first region that experienced a transition. For most of the time, both mortality and fertility rates were high keeping population size in balance. In the 18th century however, the mortality rate started to decline due to modernization (improvements in food supply and sanitation). This development led to fast population growth since fertility rate remained high. About one century later, the fertility rate declined as well bringing population growth back to low levels (see Lee (2003) for a comprehensive discussion).

¹⁴ There are studies that find a pro-health effect of democracy in Africa (see, e.g., Besley and Kudamatsu (2006), Wigley and Akkoyunlu-Wigley (2011), Gerring et al. (2012), and Kudamatsu (2012)). However, these efforts either leave out the counterfactual, or do not include fixed effects (as discussed by Ross (2006)), or do not tackle the endogeneity problem.

Warner (1997), Bloom et al. (1998), Gallup et al. (1999), Gallup and Sachs (2001), and Sachs and Malaney (2002)).

Acknowledgements I thank the editor Joakim Westerlund and two anonymous reviewers. I am also grateful to Afschin Gandjour, Bernd Lucke, and Mujaheed Shaikh for very helpful comments and suggestions. I also appreciate excellent support from Sabrina Wendt. An earlier version of this work was presented at the World Congress of the International Health Economics Association (iHEA), the Conference of the World Interdisciplinary Network for Institutional Research (WINIR), and at the joint workshop of HSU and IfW (Institute for the World Economy). I appreciate comments and suggestions from all participants. All remaining errors are mine.

Funding Open Access funding enabled and organized by Projekt DEAL.

Availability of data and material All data and materials used in this research are publicly available and all sources are named in the manuscript to replicate the results.

Declarations

Conflicts of interest There is no conflict of interest to declare for this research.

Code availability The empirical analysis in this research is performed with STATA. All codes to replicate the results can be provided.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

Appendix

See Tables 3, 4, 5, 6, 7, 8, 9, 10, and 11.

Table 3 Summary statistics

Variable	Data Source	non-SSA countries			SSA countries		
		Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
GDP per capita (const. 2000 US\$)	World Bank (WDI)	5,157	6,808	8,561	1,986	820	1,283
Total GDP (billions of const. 2000 US\$)	(own calculations)	5,157	205	816	1,986	6.37	18.2
Total population size (millions)	World Bank (WDI)	6,903	32.4	119	2,397	10.1	16.8
Population btw. 0-14 years (%-share of total)	World Bank (WDI)	6,702	33.1	9.9	2,397	44.1	3.9
Child mortality rate (per 1,000 births)	World Bank (WDI)	5,975	43.1	41.1	2,155	99.7	40.4
Democracy index (continuous, normalized)	Marshall et al. (2017)	5,721	0.53	0.39	2,088	0.38	0.30
Democracy index (dichotomous)	Acemoglu et al. (2019)	6,569	0.49	0.50	2,164	0.25	0.43
Instrument for democracy	Acemoglu et al. (2019)	6,928	0.50	0.43	2,397	0.24	0.25

Notes: This table shows summary statistics for the variables employed in the main analysis. It also indicates the data sources as explained in Section 2. Data for total GDP is calculated as the result of GDP per capita × total population size

Table 4 OLS estimates of the association between democracy (continuous) and growth

	Outcome: (log) GDP per capita								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Democracy	-5.049 (8.878)	-0.600 (0.600)	-0.318 (0.462)	0.0151 (0.436)	0.231 (0.438)	0.349 (0.450)	0.319 (0.471)	0.414 (0.492)	0.468 (0.502)
Democracy \times SSA	-49.26*** (16.99)	-0.217 (0.888)	-0.892 (0.718)	-1.355* (0.735)	-1.716** (0.755)	-1.981** (0.768)	-2.066** (0.794)	-2.212*** (0.821)	-2.333*** (0.803)
Cumulative Effect for SSA	-54.314*** (14.798)	-0.817 (0.754)	-1.210* (0.639)	-1.340** (0.646)	-1.485** (0.671)	-1.631** (0.675)	-1.746** (0.702)	-1.798** (0.739)	-1.866** (0.730)
Growth _{t-1}	(0.00533)	0.976*** (0.300***)	1.300*** (0.383)	1.266*** (0.369)	1.263*** (0.375)	1.254*** (0.392)	1.247*** (0.402)	1.247*** (0.419)	1.244*** (0.430)
Growth _{t-2}			-0.330*** (0.0380)	-0.221*** (0.0457)	-0.234*** (0.0462)	-0.225*** (0.0472)	-0.224*** (0.0483)	-0.229*** (0.0496)	-0.226*** (0.0495)
Growth _{t-3}				-0.0784*** (0.0251)	-0.0158 (0.0316)	-0.0139 (0.0317)	-0.00631 (0.0317)	-0.00325 (0.0310)	-0.00466 (0.0315)
Growth _{t-4}					-0.0501** (0.0206)	-0.0725** (0.0301)	-0.0787*** (0.0280)	-0.0849*** (0.0273)	-0.0804*** (0.0263)

Table 4 continued

	Outcome: (log) GDP per capita								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Growth _{t-5}						0.0189 (0.0194)	0.0150 (0.0235)	0.0223 (0.0223)	0.0106 (0.0228)
Growth _{t-6}							0.00647 (0.0187)	0.0151 (0.0251)	0.0200 (0.0253)
Growth _{t-7}								-0.00927 (0.0244)	0.0102 (0.0247)
Growth _{t-8}									-0.0153 (0.0251)
Observations	6,198	6,063	5,925	5,786	5,646	5,503	5,359	5,213	5,067
R ²	0.402	0.975	0.978	0.978	0.977	0.977	0.976	0.975	0.974
Countries in sample	154	153	153	153	153	153	153	153	153

Note This table investigates the number of lags in the outcome variable. We show regression outcomes that vary the number of lags from zero to eight (see column-header). All other settings are the same as those reported in Table 1. All specifications clarify that the growth process is significant only up to the fourth lag. Higher lags turn out insignificant. The estimates shown here are based on the continuous measure for democracy. The same pattern is shown by Acemoglu et al. (2019) when democracy is measured by the dichotomous index

Table 5 GMM estimates of the association between democracy (continuous) and growth

	Outcome: (log) GDP per capita								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Democracy	8.381 (11.46)	-0.510 (0.856)	-0.0464 (0.654)	0.0919 (0.626)	0.672 (0.639)	0.575 (0.669)	0.442 (0.672)	0.451 (0.719)	0.587 (0.733)
Democracy \times SSA	-48.56*** (17.56)	0.147 (1.058)	-1.104 (0.886)	-1.254 (0.874)	-2.025*** (0.950)	-2.104** (0.969)	-2.177** (1.013)	-2.271** (1.053)	-2.336** (1.030)
Cumulative Effect for SSA	-40.182*** (13.385)	-0.364 (0.822)	-1.150 (0.743)	-1.162 (0.746)	-1.353* (0.794)	-1.529* (0.785)	-1.735** (0.837)	-1.821** (0.884)	-1.750** (0.833)
Growth _{t-1}		0.965*** (0.00692)	1.279*** (0.0397)	1.249*** (0.0365)	1.242*** (0.0364)	1.234*** (0.0381)	1.227*** (0.0389)	1.226*** (0.0406)	1.225*** (0.0416)
Growth _{t-2}			-0.318*** (0.0392)	-0.216*** (0.0450)	-0.223*** (0.0450)	-0.216*** (0.0462)	-0.216*** (0.0475)	-0.221*** (0.0486)	-0.220*** (0.0486)
Growth _{t-3}				-0.0752*** (0.0265)	-0.0170 (0.0310)	-0.0103 (0.0311)	-0.00380 (0.0310)	-0.00244 (0.0304)	-0.00239 (0.0308)
Growth _{t-4}					-0.0486*** (0.0213)	-0.0733*** (0.0294)	-0.0774*** (0.0273)	-0.0824*** (0.0265)	-0.0791*** (0.0258)
Growth _{t-5}						0.0185 (0.0201)	0.0122 (0.0228)	0.0208 (0.0218)	0.0102 (0.0224)
Growth _{t-6}							0.00905 (0.0186)	0.0139 (0.0249)	0.0202 (0.0249)

Table 5 continued

	Outcome: (log) GDP per capita								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Growth _{<i>t</i>-7}								-0.00715 (0.0242)	0.0101 (0.0249)
Growth _{<i>t</i>-8}									-0.0140 (0.0265)
Observations	6,039	5,905	5,769	5,631	5,491	5,348	5,205	5,059	4,913
AR(2) test <i>p</i> value	0.000	0.003	0.212	0.021	0.444	0.248	0.593	0.261	0.310
Countries in sample	153	153	153	153	153	152	152	152	152

Note This table investigates the number of lags in the outcome variable. We show regression outcomes that vary the number of lags from zero to eight (see column–header). All other settings are the same as those reported in Table 1. All specifications clarify that the growth process is significant only up to the fourth lag. Higher lags turn out insignificant. The estimates shown here are based on the continuous measure for democracy. The same pattern is shown by Acemoglu et al. (2019) when democracy is measured by the dichotomous index

Table 6 IV estimates of the association between democracy (continuous) and growth

	Outcome: (log) GDP per capita								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Democracy	-51.41** (22.47)	3.434** (1.488)	2.367** (1.016)	2.075** (0.949)	1.768* (0.935)	1.572 (0.977)	1.306 (1.021)	1.535 (1.102)	1.644 (1.106)
Democracy × SSA	-114.5*** (34.21)	-2.832 (2.162)	-3.562** (1.565)	-3.765** (1.492)	-4.457*** (1.509)	-4.809*** (1.500)	-4.910*** (1.616)	-5.406*** (1.641)	-4.669*** (1.578)
Cumulative Effect for SSA	-165.895*** (36.602)	0.601 (2.516)	-1.195 (1.840)	-1.689 (1.805)	-2.688 (1.837)	-3.236* (1.847)	-3.604* (2.015)	-3.871* (2.046)	-3.024 (2.027)
Growth _{t-1}		0.978*** (0.00643)	1.302*** (0.0382)	1.266*** (0.0366)	1.263*** (0.0371)	1.253*** (0.0390)	1.245*** (0.0400)	1.244*** (0.0418)	1.242*** (0.0429)
Growth _{t-2}			-0.332*** (0.0379)	-0.221*** (0.0454)	-0.233*** (0.0459)	-0.224*** (0.0469)	-0.223*** (0.0479)	-0.229*** (0.0491)	-0.225*** (0.0491)
Growth _{t-3}				-0.0803*** (0.0248)	-0.0151 (0.0314)	-0.0132 (0.0314)	-0.00577 (0.0315)	-0.00256 (0.0308)	-0.00449 (0.0312)
Growth _{t-4}					-0.0524** (0.0205)	-0.0725** (0.0298)	-0.0788*** (0.0277)	-0.0849*** (0.0270)	-0.0806*** (0.0262)
Growth _{t-5}						0.0170 (0.0194)	0.0157 (0.0236)	0.0227 (0.0222)	0.0108 (0.0227)
Growth _{t-6}							0.00417 (0.0193)	0.0157 (0.0249)	0.0202 (0.0251)

Table 6 continued

	Outcome: (log) GDP per capita								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Growth _{t-7}								-0.0119 (0.0246)	0.0103 (0.0245)
Growth _{t-8}									-0.0168 (0.0255)
Observations	6,111	6,048	5,912	5,774	5,635	5,493	5,349	5,204	5,059
1st-stage F-stat	36.7	30	28.9	27.6	24.7	22	19	18.5	18.8
Countries in sample	152	152	152	152	152	152	151	151	151

Note This table investigates the number of lags in the outcome variable. We show regression outcomes that vary the number of lags from zero to eight (see column-header). All other settings are the same as those reported in Table 1. All specifications clarify that the growth process is significant only up to the fourth lag. Higher lags turn out insignificant. The estimates shown here are based on the continuous measure for democracy. The same pattern is shown by Acemoglu et al. (2019) when democracy is measured by the dichotomous index

Table 7 First-stage results for the estimates in Table 1

Specification in Table 1 Measure for Democracy	Panel A: column (5) Continuous (1)	Panel A: column (6) Dichotomous (2)	Panel B: column (5) Continuous (3)	Panel B: column (6) Dichotomous (4)
	Outcome variable: democracy			
IV_{t-1}	0.498*** (0.0678)	0.830*** (0.0723)	0.492*** (0.0666)	0.828*** (0.0707)
IV_{t-1} (cumulative effect for SSA)	0.653*** (0.108)	0.736*** (0.185)	0.687*** (0.106)	0.769*** (0.182)
Observations	5,635	6,312	5,635	6,312
Countries in sample	152	174	152	174

Note This table investigates the number of lags in the outcome variable. We show regression outcomes that vary the number of lags from zero to eight (see column–header). All other settings are the same as those reported in Table 1. All specifications clarify that the growth process is significant only up to the fourth lag. Higher lags turn out insignificant. The estimates shown here are based on the continuous measure for democracy. The same pattern is shown by Acemoglu et al. (2019) when democracy is measured by the dichotomous index

This table shows the first-stage results for the IV specifications shown in Table 1

Table 8 Estimates of the association between democracy (dichotomous) and growth-related channels

Outcome Variable Estimator	log Population size			Population Structure (share 0-14 years)			log Child Mortality Rate		
	OLS (1)	GMM (2)	IV (3)	OLS (4)	GMM (5)	IV (6)	OLS (7)	GMM (8)	IV (9)
Democracy	-0.0826*** (0.0235)	-0.0496 (0.0374)	-0.130** (0.0528)	-0.0318*** (0.00748)	-0.0380*** (0.0115)	-0.0435** (0.0196)	-0.336*** (0.0810)	-0.304*** (0.107)	-0.727*** (0.163)
Democracy × SSA	0.190*** (0.0446)	0.188*** (0.0656)	0.543*** (0.191)	0.0546*** (0.0118)	0.0693*** (0.0200)	0.165*** (0.0478)	0.225*** (0.109)	0.149 (0.142)	0.489 (0.319)
Cumulative Effect for SSA	0.1075*** (0.036)	0.138*** (0.051)	0.414** (0.191)	0.0228** (0.010)	0.0313** (0.016)	0.1214** (0.055)	-0.111 (0.083)	-0.156 (0.095)	-0.238 (0.356)
Persistence of outcome variable	0.9971*** (0.001)	0.9961*** (0.001)	0.9963*** (0.001)	0.9882*** (0.001)	0.9836*** (0.002)	0.9867*** (0.001)	0.9922*** (0.001)	0.9909*** (0.002)	0.9917*** (0.001)
Observations	6,347	6,172	6,323	6,273	6,021	6,249	6,084	5,911	6,060
R ²	1.000			0.999			0.999		
AR(2) test <i>p</i> value		0.475			0.158			0.394	
1st-stage F-statistics			8.6			8			7.1
Countries in sample	175	175	174	172	172	171	173	173	172

Note This table shows specifications for the mechanisms of democracy. It differs from Table 2 only by the measure for democracy which is dichotomous here. The estimates show the same qualitative pattern as discussed in the main text for Table 2

Table 9 OLS estimates of the association between democracy (continuous) and growth-related channels

Outcome Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	log Population size	Population size	Population size	Population size	Population size	Population Structure (share 0-14 years)	Population Structure (share 0-14 years)	Population Structure (share 0-14 years)	log Child Mortality Rate	log Child Mortality Rate	log Child Mortality Rate	log Child Mortality Rate
Democracy	-0.0898*** (0.0339)	-0.0938*** (0.0344)	-0.308* (0.157)	-12.04** (4.759)	-0.0435*** (0.0102)	-0.0443*** (0.0103)	-0.120** (0.0559)	-2.569*** (0.752)	-0.419*** (0.107)	-0.418*** (0.107)	-0.968** (0.430)	-23.12*** (6.334)
Democracy × SSA	0.284*** (0.0757)	0.285*** (0.0761)	1.089*** (0.289)	30.05*** (6.943)	0.0816*** (0.0184)	0.0856*** (0.0188)	0.0783 (0.0835)	6.746*** (1.270)	0.374*** (0.166)	0.398*** (0.170)	-0.370 (0.695)	51.54*** (9.184)
Cumulative Effect for SSA	0.195*** (0.065)	0.191*** (0.066)	0.781*** (0.263)	18.00*** (6.432)	0.038*** (0.016)	0.041** (0.017)	-0.042 (0.067)	4.178*** (1.268)	-0.044 (0.143)	-0.021 (0.142)	-1.339** (0.596)	28.42*** (8.155)
First lag of outcome variable	2.034*** (0.188)	1.836*** (0.0321)	0.997*** (0.00241)	0.997*** (0.00241)	1.904*** (0.0391)	1.857*** (0.0201)	0.996*** (0.00440)	0.996*** (0.00440)	1.875*** (0.0702)	1.838*** (0.0165)	0.997*** (0.00348)	
Second lag of outcome variable	-1.262*** (0.369)	-0.840*** (0.0320)	-0.840*** (0.0320)	-0.840*** (0.0320)	-0.969*** (0.0671)	-0.869*** (0.0198)	-0.969*** (0.0671)	-0.969*** (0.0671)	-0.928*** (0.145)	-0.848*** (0.0162)	-0.848*** (0.0162)	
Third lag of outcome variable	0.225 (0.183)	0.225 (0.183)	0.225 (0.183)	0.225 (0.183)	0.0535* (0.0307)	0.0535* (0.0307)	0.0535* (0.0307)	0.0535* (0.0307)	0.0441 (0.0761)	0.0441 (0.0761)	0.0441 (0.0761)	
R ²	1.000	1.000	0.999	0.797	0.999	0.999	0.996	0.660	0.999	0.999	0.998	0.836
Observations	5,654	5,654	5,654	5,654	5,654	5,654	5,654	5,654	5,445	5,463	5,479	5,495
Countries in sample	153	153	153	153	153	153	153	153	151	151	151	151

Note This table shows OLS specifications for the three growth-related channels discussed in Table 2. Therein, the R-square term is very close to unity. Here, we successively reduce the number of lags of the outcome variables. The pattern does not change from the conclusion drawn in the main text (see also Footnote 12 in the main text)

Table 10 First-stage results for the estimates in Tables 2 and 8

Specification in Measure for Democracy	Table 2: column (1) Continuous	Table 2: column (2) Continuous	Table 2: column (3) Continuous	Table 2: column (6) Continuous	Table 2: column (9) Continuous	Table 8: column (3) Dichotomous	Table 8: column (4) Dichotomous	Table 8: column (5) Dichotomous	Table 8: column (6) Dichotomous	Table 8: column (9) Dichotomous
Outcome variable: democracy										
IV_{t-1}	0.506*** (0.0655)	0.496*** (0.0675)		0.454*** (0.0708)		0.839*** (0.0704)		0.833*** (0.0727)		0.777*** (0.0757)
IV_{t-1} (cumulative effect for SSA)	0.651*** (0.106)	0.623*** (0.111)		0.615*** (0.118)		0.722*** (0.183)		0.712*** (0.188)		0.700*** (0.193)
Observations	5,643	5,643		5,415		6,323		6,249		6,060
Countries in sample	152	152		150		174		171		172

Note This table shows the first-stage results for the IV specifications shown in Table 2. It also displays the first-stage results for the IV specifications shown in Table 8

Table 11 Effect of population size and age structure on growth

Estimator	OLS (1)	GMM (2)	OLS (3)	GMM (4)
	Outcome variable: log GDP per capita			
log Population size	-0.00491 (0.00714)	-0.000211 (0.0108)		
log Population size \times SSA	-0.0201*** (0.00689)	-0.0320*** (0.0119)		
Cumulative effect for SSA	-0.025*** (0.006)	-0.032*** (0.011)		
Age structure			-0.235*** (0.0395)	-0.296*** (0.0607)
Age structure \times SSA			0.152** (0.0725)	0.168* (0.0883)
Cumulative effect for SSA			-0.084 (0.081)	-0.128 (0.105)
Persistence of outcome variable	0.959*** (0.006)	0.944*** (0.009)	0.955*** (0.005)	0.941*** (0.008)
Observations	5,575	5,421	5,575	5,421
R ²	0.977		0.977	
AR(2) test <i>p</i> value		0.885		0.695
Countries in sample	153	153	153	153

Note This table shows OLS and GMM estimates for the effects that total population size and share of young people have on GDP per capita. The estimates show that irrespective of the estimator, an increase in population size has negative effects on GDP per capita in the SSA countries. In the non-SSA countries, the effect is insignificant. Moreover, an increase in the share of young people has negative effects on GDP per capita in the non-SSA countries (note that this share decreases due to democracy). In the SSA countries in turn, that share has no significant effect on GDP per capita

References

- Acemoglu D, Johnson S (2007) Disease and development: the effect of life expectancy on economic growth. *J Polit Econ* 115(6):925–985
- Acemoglu D, Naidu S, Restrepo P, Robinson JA (2019) Democracy Does Cause Growth. *Journal of Political Economy* 127(1):47–100
- Arellano M, Bond S (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Rev Econ Stud* 58(2):277–297
- Artadi EV, Sala-i Martin X (2003) The Economic Tragedy of the XXth Century: Growth in Africa. Working Paper 9865, National Bureau of Economic Research
- Asiedu E (2002) On the determinants of foreign direct investment to developing countries: Is Africa different? *World Develop* 30(1):107–119
- Becker GS (1960) An Economic Analysis of Fertility. *Demographic and Economic Change in Developed Countries*. Columbia University Press, NY, pp 209–240
- Becker GS (1962) Investment in human capital: a theoretical analysis. *J Polit Econ* 70(5, Part 2):9–49
- Ben-Porath Y (1967) The production of human capital and the life cycle of earnings. *J Polit Econ* 75(4, Part 1):352–365
- Besley T, Kudamatsu M (2006) Health and democracy. *Am Econ Rev* 96(2):313–318
- Bloom DE, Sachs JD, Collier P, Udry C (1998) Geography, demography, and economic growth in Africa. *Brook Papers Econ Activity* 1998(2):207–295
- Brückner M, Ciccone A (2011) Rain and the democratic window of opportunity. *Econometrica* 79(3):923–947
- Cervellati M, Jung F, Sunde U, Vischer T (2014) Income and democracy: comment. *Am Econom Rev* 104(2):707–19
- Collier P, Gunning JW (1999) Why has Africa grown slowly? *J Econ Perspect* 13(3):3–22
- Dalgaard C-J, Hansen H, Tarp F (2004) On the empirics of foreign aid and growth. *Econ J* 114(496):F191–F216
- Easterly W, Levine R (1997) Africa's growth tragedy: policies and ethnic divisions. *Q J Econ* 112(4):1203–1250
- Gallup JL, Sachs JD (2001) The economic burden of Malaria. *Am J Trop Med Hygiene* 64(1–suppl):85–96
- Gallup JL, Sachs JD, Mellinger AD (1999) Geography and economic development. *Int Reg Sci Rev* 22(2):179–232
- Galor O, Weil DN (2000) Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond. *American Economic Review* 90(4):806–828
- Gerring J, Thacker SC, Alfaro R (2012) Democracy and human development. *J Polit* 74(1):1–17
- Huntington SP (1991) Democracy's third wave. *J Democr* 2(2):12–34
- Kudamatsu M (2012) Has democratization reduced Infant Mortality in Sub-Saharan Africa? evidence from micro data. *J Eur Econ Assoc* 10(6):1294–1317
- Lee R (2003) The demographic transition: three centuries of fundamental change. *J Econ Perspect* 17(4):167–190
- Marshall MG, Gurr TR, Jagers K (2017) Polity IV Project—Political Regime Characteristics and Transitions, 1800–2016. Technical report
- Nunn N (2007) Historical legacies: a model linking africa's past to its current underdevelopment. *J Develop Econ* 83(1):157–175
- Papaioannou E, Siourounis G (2008) Democratisation and growth. *Econ J* 118(532):1520–1551
- Peterson EWF (2017) The role of population in economic growth. *SAGE Open* 7(4):1–15
- Ross M (2006) Is democracy good for the poor? *Am J Polit Sci* 50(4):860–874
- Sachs J, Malaney P (2002) The economic and social burden of Malaria. *Nature* 415(6872):680–685
- Sachs JD, Warner AM (1997) Sources of slow growth in African economies. *J African Econ* 6(3):335–376
- Wigley S, Akkoyunlu-Wigley A (2011) The impact of regime type on health: does redistribution explain everything? *World Polit* 63(4):647–677