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No country for old men: Aging dictators and economic growth[☆,☆☆]

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ABSTRACT

Why do some autocracies have higher economic growth rates than others? An emerging literature is highlighting that in addition to economic and institutional variables, personal characteristics of political leaders affect economic growth rates. Within this tradition, we develop a political-economic growth model of the relationship between the age of a dictator and economic growth. The model predicts that if a dictator's mortality risk increases, the economic growth rate in his country decreases. The model predictions are supported by empirical evidence based on a large sample of more than 400 dictators from 76 countries. A 1-year increase in dictator age, decreases economic growth by 0.12 percentage points. Using random leadership transitions due to natural deaths or terminal illnesses we establish that this effect is not driven by endogenous sample selection. As expected, the effect is absent in democratic political regimes.

1. Introduction

Why do some autocracies have higher economic growth rates than others? This question has been intensively studied throughout the years (see e.g., Bueno de Mesquita et al. (2003), Besley and Kudamatsu (2008) and Gandhi (2008)).

A relatively new strand of the literature argues that not only economic and institutional variables affect economic growth rates, but that also that personal characteristics of the political leader are drivers of economic growth. In fact, Jones and Olken (2005) argue, that especially in autocratic regimes, where checks and balances are mostly weak, political leaders are responsible for (changes in) the economic growth rate. According to Besley et al. (2011), this can be attributed to differences in education levels of political leaders. Furthermore, Dreher et al. (2009) find evidence that it also relates to the attitudes of political leaders towards economic reform (see also Li et al., 2020). A completely different view is provided by Easterly and Pennings (2018), who argue that political leader effects are mostly surprises that are hard (if not impossible) to relate to personal traits of the leader.

In this paper, we aim to contribute to the hypothesis that autocratic leaders matter for economic growth outcomes. That is, we aim to test the hypothesis put forward by Olson (1993) and McGuire and Olson (1996), who argue that autocratic political leaders come in two types: "roving bandits" and "stationary bandits".[1] As Olson (1993, p 567) writes:

> "Under anarchy, uncoordinated competitive theft by "roving bandits" destroys the incentive to invest and produce, leaving little for either the population or the bandits. Both can be better off if a bandit sets himself up as a dictator–a "stationary bandit" who monopolizes and rationalizes theft in the form of taxes. A secure autocrat has an encompassing interest in his domain that leads him to provide a peaceful order and other public goods that increase productivity. Whenever an autocrat expects a brief tenure, it pays him to confiscate those assets whose tax yield over his tenure is less than their total value. This incentive plus the inherent uncertainty of succession in dictatorships imply that autocracies will rarely have good economic performance for more than a generation."

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[1] Of course, there are other ways to classify autocrats. Wintrobe (1990), for example, uses a different dichotomy and distinguishes between tin-pot dictators, who aim to minimize the costs of remaining in power, and totalitarian dictators, who aims to maximize power over the population.

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That is, roving bandits are dictators with high discount rates that expropriate as much as possible once they enter office, while stationary bandits expect to have long office duration. Since the latter cares about the future, he has an incentive to invest in growth enhancing policies and institutions.[2]

Whether a dictator is roving or stationary is not randomly determined. Some political elites may have specific preferences for a certain type. The selection of (the appropriate) political leaders has been studied in citizen-candidate models (e.g. Osborne and Slivinski, 1996; Besley and Coate, 1997). Furthermore, the so-called selectorate theory of Bueno de Mesquita et al. (2003) elaborates upon the strategic interaction between (s)electorates and political elites in their struggle for power. Building upon the selectorate theory, Yu and Jong-A-Pin (2020) find that especially the discount factor, as determined by the level of political (in) stability, in a country determines what type of political leader is (s) elected. Besides the impact of political (in)stability on leader selection, there are several studies that also suggest a direct effect of political instability on economic growth (e.g., Alesina et al. (1996), Jong-A-Pin (2009), Akhter Akther Uddin et al. (2017)).

In this paper we elaborate on the relationship between a dictator's discount factor and his type. Apart from the level of political (in)stability in the country, we argue that the dictators' discount factor is also determined by his mortality. That is, when dictators grow older, they care less about the future, because the probability of natural death increases. All other things equal (e.g., political instability), a dictator will start off as a (relatively) stationary bandit but becomes more and more roving as time passes by - simply because his time horizon has decreased. Consequently, the age of a dictator partly determines whether he is roving or stationary and, hence, dictators' age and economic growth are negatively related.

To illustrate our argument, we consider a dynamic version of the arguments developed in Olson (1993) and McGuire and Olson (1996). In particular we develop a two-period model and allow for a probability of death between the two subsequent periods. In the model a dictator optimizes his own utility by choosing between investments in capital goods and extracting rents. Whereas investments in capital goods will ensure higher national income and higher future utility, extracting rents from the economy increases instantaneous utility but comes at the cost of lower economic growth. Not surprisingly, the dictator will only invest in growth enhancing policies if he is likely to reap the benefits of future economic growth. Older dictators will, therefore, extract more than younger dictators.

We test the empirical prediction of our model using a panel data set of 413 dictators around the world since the 1950's. To test the impact of age on economic growth, we rely on the dataset of Bjørnskov and Rode (2020), who provide data on political leaders for the period 1950–2019. Our economic growth data is taken from the most recent edition of the Penn World Tables, version 10.0 (Feenstra et al., 2015). In our regression analysis we control for several economic growth determinants such as (human) capital and economic openness, but also control for political variables including political instability, the type of dictatorship and the quality of institutions. Furthermore, we also control for unobserved heterogeneity that can be attributed to either the political leader or the country. To go beyond mere correlations and to establish the causal impact of aging on economic growth, we follow the approach of Jones and Olken (2005) and Besley et al. (2001) and also use a sample of dictators that drop from office due to (exogenous) natural death.

Previewing our results, we find a negative, albeit small, statistically significant impact of dictator aging on economic growth. This effect is not driven by endogeneity arising from the fact that bad dictators are more likely to be ousted from office. Indeed, using random leadership transitions due to natural deaths or terminal illnesses, we establish a causal relation running from the age of a dictator to the growth performance of a dictator. Moreover, we do not find the same effect when we use placebo regressions in which we focus on democratically elected leaders instead of dictators. Hence, indicating that our findings are not spurious. When we distinguish between different type of dictatorships, we find that our results are driven by military dictatorships and monarchic dictatorships and not by civilian dictatorships.

The findings of our paper build upon the evidence provided by Papaioannou and van Zanden (2015). In contrast to their study that focuses on Africa, we focus on a larger sample of dictators all over the world for the period 1951–2019 and (unlike their study) we aim to take stock of causality. Our study also contributes to other strands of the literature. Obviously, it fits in with the broad field focusing on political regimes and economic development. On the one hand, this literature focuses on the question whether dictatorships have a different impact on economic growth than democracies (e.g., Doucouliagos and Ulubaşoğlu, 2008). On the other hand, this literature stresses that economic outcomes are the result of the interplay between political leaders, the (s)electorate, and the power structure as a consequence of existing political institutions (Bueno de Mesquita et al., 2003; Acemoglu and Robinson, 2006; Congleton, 2011; Salter, 2015).[3] Our research also relates to studies that have focused on the interplay between economic growth, institutional quality, and the tenure of political leaders (e.g. Holcombe and Boudreaux, 2013; Murphy and O'Reilly, 2020).

The remainder of the paper is structured as follows. The next section formalizes our main argument and introduces the empirical hypothesis. We describe the data in Section 3 and provide our empirical strategy in Section 4. The estimation results and various robustness analyses are presented in Section 5. Section 6 concludes.

2. Model and hypotheses

We consider an all-powerful dictator who reigns for two periods but transition between the periods is probabilistic. On the one hand, the dictator may die of natural causes; on the other hand, the dictator may be ousted from office. If he dies of natural causes he wants to leave the economy in such a state that his heir apparent, who may be a son, but also someone else, inherits a sound economy.

The production sector is characterized by a linear production technology that depends on the aggregate capital stock and the, fixed, level of technology. The production function is given by: $Y_t = AK_t$, where Y_t is aggregate output at time t, A is the state of technology and K_t is the capital stock. From the perspective of a dictator who came into power at time t, K_t is the initial capital endowment.

The dictator must decide how many consumption goods to extract from the economy every period. All productive assets that are not extracted as consumption goods may be used for productive purposes in the next period. The discounted life-time utility function of a dictator who came into power at time t is given by:

$$\Lambda_t = \ln(C_t) + \left(1 - \frac{1}{\theta}\mu\right)(1-\pi)\ln(C_{t+1}) + (1-\mu)\left(1 - \frac{1}{\theta}\right)(1-\pi)^2\ln(B_{t+2}) \tag{1}$$

where C_t is consumption, $0 < \pi < 1$ is the probability of being ousted from office in each period, $0 < \mu < 1$ is the probability of dying of a natural cause before period 2, $\theta \geq 1$ governs the preference attached to

[2] Throughout the paper we refer to the dictator as *he*. This is politically correct because all dictators in our empirical sample are men.

[3] In particular, Salter (2015) argues that the model of Olson (1993) must be considered as the (theoretical) extreme case of pure autocracy. He argues that, in pure autocracies, the decision-making calculus is, indeed, driven by the preferences of the dictator. Yet, even in highly autocratic countries there are elements that influence the dictator. For example, an advisory council of close confidants. To take account of (informal) power structures, we include several control variables capturing political institutions as well as fixed effects in our empirical analysis.

the heir apparent (see below) and B_{t+2} is the bequest the dictator leaves to his heir apparent.[4] In the second period of the dictator's reign the utility function becomes:

$$\Lambda_{t+1} = \ln(C_{t+1}) + \left(1 - \frac{1}{\theta}\right)(1-\pi)\ln(B_{t+2}) \tag{2}$$

and he essentially faces the problem of dividing the productive assets in the economy between current consumption and a bequest for his heir apparent. The dictator discounts the bequest by the probability of being ousted from office, π, because he takes into account that upon his certain death someone else besides his heir apparent may seize power.

As the dictator has full power over the economy, his optimization problem essentially is how to spread his initial capital endowment, K_t, over his full reign. However, even though the dictator faces a mortality risk, μ, this does not imply that the country dies with him. Depending on his expectation concerning succession he attaches more or less utility to the capital left for his heir apparent. The more he values his heir apparent the higher is θ.

Effectively θ mitigates time discounting due to mortality. If $\theta = 1$, Equation (1) collapses to the standard two-period life-cycle model. However, if $\theta > 1$ the standard model is generalized to allow for bequests. In the first period a higher θ leads to less discounting of the mortality factor.[5] That is, if θ is high the dictator will invest more in period 1 because even if he is not around to consume the benefits from the investment his heir will be. In the second period θ acts to give utility value to bequests left for the heir apparent. The heir apparent uses the bequests received from the perished dictator as his initial capital endowment. Therefore, the dictator effectively chooses the level of capital that his heir apparent is endowed with and we can set $B_{t+2} = I_{t+1}$, where I_{t+1} is the amount of productive investments at time *t*.

In addition to mortality risk, the dictator faces a probability, π, of being ousted from office by, for instance, a coup d'etat. As the dictator attaches no value to the utility of a successor that ousted him from office θ does not affect his time discounting due to uncertain political survival. That is, if the dictator knows that he will be ousted from office within one period (i.e. $\pi = 1$) the dictator will execute a policy of maximal extraction. On the other hand, if the dictator knows that he will perish ($\mu = 1$) tomorrow he would still leave a substantial amount of productive assets to his heir apparent as initial endowment. Thus, political risk, π, and mortality risk, μ, affect the dictator's time horizon in a fundamentally different way.[6]

The dictator's decision problem is constrained by the resource constraint. That is, aggregate output in both periods must be divided between consumption and productive investments:

$$Y_t = C_t + I_t \tag{3}$$

Assuming full depreciation of productive assets[7] after each period allows us to write the capital accumulation function as $K_{t+1} = I_t$ so that we can write the resource constraint as:

$$AK_t = C_t + K_{t+1} \tag{4}$$

where we have substituted in the aggregate production function.

A young dictator chooses combinations of $C_t,\ C_{t+1}$ *and* B_{t+2} such that (1) is maximized subject to (4). Similarly, an old dictator chooses combinations of C_{t+1} *and* B_{t+2} such that (2) is maximized subject to (4). From the maximization problems of the individual dictators the economic growth rate of the economy, $\frac{Y_{t+1}}{Y_t} \equiv 1 + g_t$, arises residually. Comparative statics on $1 + g_t$ lead us to the following hypothesis concerning economic growth and dictators[8]

H.1 Economic growth g decreases as the mortality rate of the dictator increases: $\frac{\partial(1+g_t)}{\partial\mu} < 0$

In the empirical analysis that follows we seek to determine the validity of this hypothesis.

Before proceeding, it is instructive to briefly reflect on the generality of the arguments developed in the above model. We have also studied how the introduction of mortality risk between two periods affects the economic policy engaged in by a dictator in the more elaborate model of Acemoglu (2005). In that model, output is produced by a combination of public infrastructure and effort of the citizens. The dictator optimizes his life-time utility by choosing between investments in public infrastructure and extracting rents. While investments in infrastructure ensure higher future national income and higher future dictator utility, extracting rents from the economy increases instantaneous utility. In order to finance any expenditures, the dictator must impose taxes on the citizens. As in the analysis of Olson (1993) and McGuire and Olson (1996) the tax causes distortions. In particular, a higher tax causes the citizen to exert less effort in the production process. This implies that higher taxes can finance more public infrastructure, which increases output, but that too high taxes reduce effort to the point that total output decreases. Hence, the dictator is faced with a Laffer-curve constraint. Moreover, and in addition to the analysis of Olson and McGuire and Olson, in that model the dictator is also constrained by the fact that if taxes are too high, citizens simply hide their output. Thus, the dictator has to assure that a.) the tax is on the left side of the Laffer curve and b.) the tax is such that the citizens do not hide their output. Naturally, the dictator will only invest in growth enhancing policies if he is likely to reap the future benefits. Hence, when we introduced a mortality risk in that model, we also found a negative relationship between the age of a dictator and his economic performance. That model is, however, more involved and elaborate to analyze and for the current purpose we feel that the model developed above makes the point we wish to make in the most parsimonious way. Our analysis of the Acemoglu (2005) model extended with a mortality risk is available on request.

3. Data

Our dependent variable is taken from the Penn World Table (version 10.0) of Feenstra et al. (2015) and measures yearly real GDP growth per capita. Economic growth data for most countries is available from 1950 until 2019.[9] Our main explanatory variable is the age of a dictator. Data on the age of political leaders is obtained from the dataset of Bjørnskov and Rode (2020), who provide an update and extension of the Cheibub

[4] If $\mu = 1$, Equation (1) collapses to a two-period optimal bequest model as in Equation (2). In addition, if the dictator would reign for n periods instead of 2 Equation (1) becomes: $\Lambda_t = \ln(C_t) + \sum_{i=1}^{N} \prod_{j=1}^{i}(1-\pi_j)\prod_{j=1}^{i-1}(1-\mu_j)\left(1 - \frac{1}{\theta}\mu_i\right)\ln(C_{t+i}) + \prod_{j=1}^{n}(1-\pi_j)\prod_{j=1}^{n-1}(1-\mu_j)\left(1-\frac{1}{\theta}\right)\ln(B_{t+n})$, where both μ and π may change over time. For sake of clarity, we focus on the two-period setting in the text. The hypothesis derived below are unchanged if we consider an n-period setting. Naturally, if $\mu = 1$ we would not be able to study the relation between growth and mortality.

[5] Note that if the dictator dies before the second period, the consumption of that period becomes the bequest of his heir apparent.

[6] Short-termism in policy making is not a feature unique to dictatorships. See, for instance, Aidt and Dutta (2007) for an example of how so-called policy myopia may arise in a democracy populated by rational voters.

[7] Assuming that both periods cover 10 years and that the annual depreciation rate is 15% gives a compound depreciation rate over the full period of 80% $(1-(1-0.15)^{10}$ which is observationally close to full depreciation.

[8] See the Math Appendix for the solution of the model and derivation of the comparative static effects.

[9] Hanousek et al. (2008) and Johnson et al. (2013) criticize the use of the Penn World Table for time-series cross-country analysis as it makes us of internationally harmonized prices. We acknowledge this criticism and use the economic growth variable provided by the World Development Indicators of the World Bank for robustness.

Table 1
An overview autocratic political leaders with long tenure.

Name	Country	Dictatorship type	Tenure	Max. Age
Sobhuza II	Swaziland	Royal dictatorship	64	86
Haile Selassie	Ethiopia	Royal dictatorship	58	82
Hassanal Bolkiah	Brunei	Royal dictatorship	53	74
Qaboos bin Sais	Oman	Royal dictatorship	49	79
Fidel Castro Ruz	Cuba	Civilian/military dictatorship	49	82
Kim Il Sung	North Korea	Military dictatorship	46	82
Hussein	Jordan	Royal dictatorship	46	63
Tribhuvan	Nepal	Royal dictatorship	43	48
Oman Bongo	Gabon	Civilian dictatorship	42	74
Miammar Al-Gadaffi	Libya	Military dictatorship	41	68
Teodoro Obiang Bguema Mbasogo	Equatorial Guinea	Military dictatorship	41	78

et al. (2010) database. This data set includes information on political leaders up till 2019 and this demarcates the boundary of our sample. To identify autocratic leaders, we use the measure of Przeworski et al. (2000), who define an autocracy as a political regime where there is no reasonable probability that the incumbent power is replaced after an election (or where elections are absent).[10]

The sample that we use in our baseline model consists of 368 presidential autocrats and 45 monarchic autocrats.[11] These leaders have ruled, or still rule, in 97 different countries. The oldest leader in our sample is Etienne Eyadama of Togo, who left office at the age of 99. The youngest leaders in the sample are Hussein Ibn Talal El-Hashim, who came into power at age 17 and remained the leader of Jordan for 46 years, and King Tribhuvan of Nepal, who came to power at the age of 5 and stayed in office for 43 years. In total, there are a number political leaders who had similarly long stays in office. The leaders are summarized in Table 1, which also indicates at which age they dropped from office. On average, a dictator in our sample is 57 years old and remains in power for a period of 10 years. Fig. 1 shows the sample distribution of the age of the dicators. The distribution is normal, which is confirmed by a Jarque-Bera test. Table 2 shows more descriptive statistics (and definitions and sources) of the variables that we use in our analysis.

In Fig. 2a we explore the relation between the age of dictators and economic growth. We show the difference in average economic growth for dictators when they are young and when they are old. That is, we compare the economic growth performance of dictators during the first and second half of their reign. It can be seen that, on average, economic growth is higher in the first half than in the second half. In Fig. 2b, we show the same relation, but now only for dictators that have been in power for at least 20 years. The figure illustrates that the negative relationship between age and economic growth is even stronger for dictators that have been in power for such a long period. Although the figures give tentative support to our hypothesis that, as they age, leaders have lower economic growth rates, we turn to a more thorough analysis below.

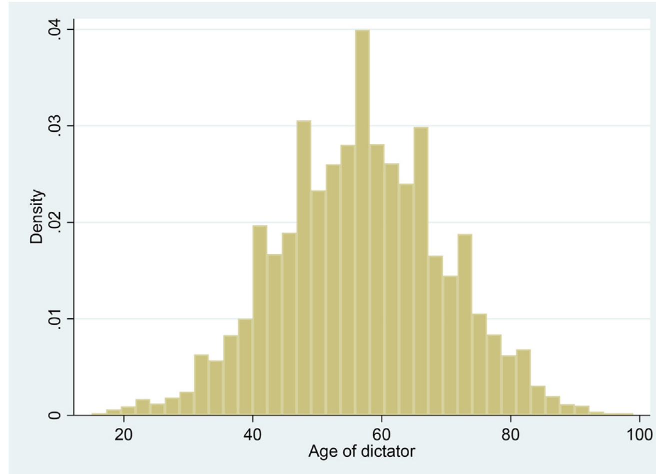

Fig. 1. Sample distribution of the age of dictators.

4. Estimation strategy

To test our hypothesis, we estimate a panel regression model, which, in its most general form, is written as:

$$g_{i,j,t} = \alpha_i + \gamma_j + Age_{i,j,t}\beta + Z_{i,t}\varphi + \varepsilon_{i,j,t} \tag{5}$$

where $g_{i,j,t}$ is the yearly economic growth rate achieved in country i by dictator j at time t. α and γ are country and dictator effects, respectively.[12] $Age_{i,j,t}$ is our key variable of interest, Z is a vector of country specific control variables, β and φ are vectors of regression parameters and ε is the error term which is assumed to be random.

The dictator fixed effect controls for unobserved heterogeneity between dictators that does not vary over the term in office (such as the level of managerial skills). This implies that for our main analysis we focus on the variation in the data *within* dictators and, hence, that we examine the impact of age when an individual dictator grows older.

Naturally, estimating a reduced form equation involves issues of endogeneity. In our context endogeneity may arise as a consequence either of attrition (selection bias) or omitted variables. The attrition bias can result from the fact that leaders can drop from the sample as a consequence of poor economic performance. That is, we may observe bad performance of leaders toward the end of their term because leaders with low economic performance face a higher probability of being ousted. To address this potential problem, we also provide estimates for our model in which we select the sample of dictators of which the term ended because of exogenous reasons. In this regard, we follow Besley et al. (2011) by using their data to focus on the sub-sample of leaders that either died of natural causes or were incapacitated by illness. By doing so, we are confident that our results are not driven by sample selection.[13] After all, lower economic growth rates do not cause natural deaths or disease of political leaders per sé. To identify the leaders that dropped from office because of natural death or disease, we make use of the

[10] This measure has the advantage that it provides a clear dichotomy between democracies and autocracies. However, the strict division between democracies and autocracies comes at the cost that some democracies (e.g. South Africa) are labeled as autocracy, since even though the political process is democratic, the opposition has no reasonable chance to take power (a discussion can be found in Cheibub et al., 2010). To check whether our results depend on the choice of democracy indicator, we also use the Polity index of Marshall and Gurr (2020) to test for robustness.

[11] In many civilian autocracies, the country is not only led by the autocratic (often) president, but there is also a prime-minister, who possibly is a straw man of the autocratic leader. Next to the presidents and monarchs, our sample includes 54 prime ministers. To err on the side of caution, we also include dummies to control for the potential effects, if any, of these prime ministers.

[12] Note that it is not possible to actually estimate a model with country and dictator fixed effects included simultaneously because the former is subsumed in the latter. Hence, when estimating our empirical model, we rely only on dictator fixed effects.

[13] An alternative interpretation of the endogeneity problem is that leaders with good growth performance are more likely to stay in power. This would imply that the found coefficient is a lower bound of the true effect. In general, we expect the effect of the potential endogeneity problem to be limited. See, for example, Bienen and van de Walle (1992) or Crespo Cuaresma et al. (2011), who both find no evidence for a robust relation running from economic growth to leader survival.

Table 2
Summary Statistics, definitions and sources of all variables in the analysis.

Label	Definition	Obs	Mean	Std. dev.	Min	Max	source
economic growth	Real GDP per capita growth (pwt)	4.647	1,45	7,65	−110,90	66,36	Feenstra et al. (2015)
economic growth	Real GDP per capita growth (wdi)	3.836	1,74	6,99	−64,99	140,37	World Bank Development Indocators (2021)
Investment share	Share of gross capital formation at current PPPs	4.647	19,58	12,07	−10,11	95,02	Feenstra et al. (2015)
Economic Openness	Share of merchandise exports at current PPPs	4.647	18,13	23,81	0,00	282,22	Feenstra et al. (2015)
Government spending	Share of government consumption at current PPPs	4.647	19,85	11,67	0,61	179,17	Feenstra et al. (2015)
Human capital	Secondary School enrollment	3.783	11,40	12,36	0,10	72,04	Barro and Lee (2013)
Population growth	Population growth	4.647	2,38	1,71	−25,03	17,63	Feenstra et al. (2015)
Political instability/coup d'etat	Coup attempts (dummy)	4.647	0,08	0,26	0,00	1,00	Bjørnskov and Rode (2020)
World Bank Political Stability Index	Political stability index (wdi)	1.411	−0,51	0,92	−3,01	1,62	World Bank Development Indocators (2021)
Cold war dummy	Cold war dummy	4.647	0,58	0,49	0,00	1,00	own calculation
Civil war dummy	Civil war dummy	4.647	0,00	0,03	0,00	1,00	Gleditsch et al. (2002)/Petterson et al. (2021)
Polity 2 democracy-autocracy index	Polity 2 democracy-autocracy index	4.200	−4,33	4,85	−10,00	10,00	Marshall and Gurr (2018)
Age of dictator	Age of dictator	4.647	57,31	12,69	18,00	99,00	Bjørnskov and Rode (2020)

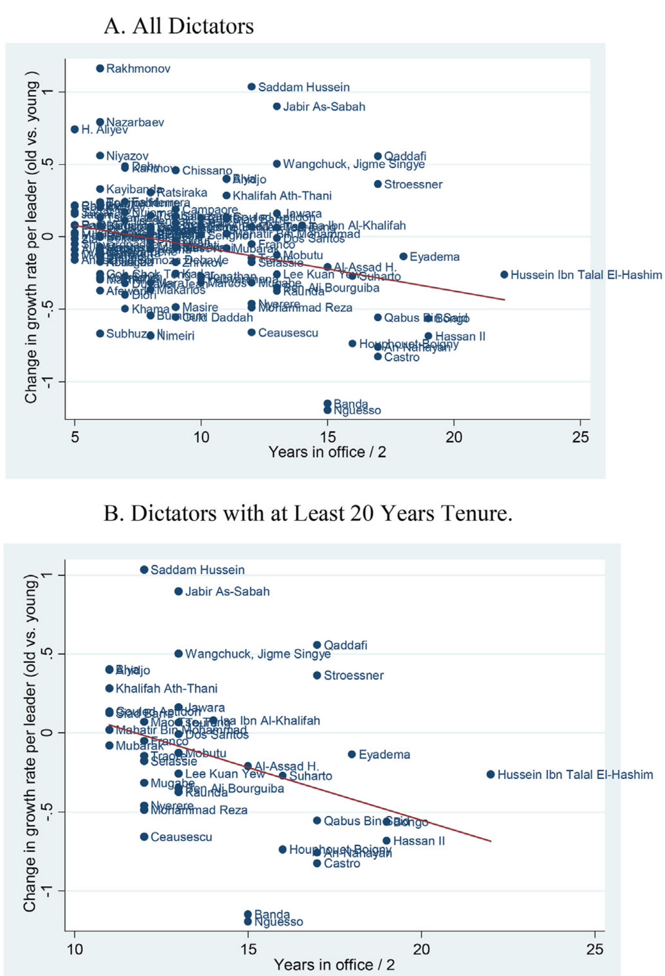

Fig. 2. Comparison of economic growth between first and second half of tenure of dictator. 2A. All dictators. 2B. Dictators with at least 20 Years tenure.

Political Leaders' Affiliation Database of Dreher et al. (2020), who have updated the dataset of Besley et al. (2011).

To control for endogeneity resulting from omitted variables bias, we include a set of standard control variables in the growth regressions. These variables can be categorized into two groups: economic variables and political/institutional variables. As to the economic control variables, we include the ratio of total investments to GDP, the ratio of government expenditures to GDP, economic openness, i.e., exports relative to GDP, and the level of secondary school enrollment as a proxy for human capital.[14] As to the political variables, we include a crude measure of political (in)stability. That is, we include a dummy variable equal to 1 whenever in a particular country in a particular year there was an attempted coup d'etat. We took this measure (also) from the Bjørnskov and Rode (2020) dataset. As a robustness check, we also employ a broader measure of political instability that is taken from the World Development Indicators of the World Bank. This measure is a composite index of different dimensions of political instability. Even though a broader measure of political instability is to be preferred, this measure is only available from 1996 onwards, which explains our preference for the coup measure. Besides the political instability measure, we also include a measure for political violence. That is, we use the Internal Armed Conflict variable measure from the Uppsala Conflict Data Program dataset (Gleditsch et al., 2002; Pettersson et al., 2021).[15] For our purpose, we construct a dummy that equals 1 whenever (according to this measure), there is "internal war", and 0 otherwise. We also include a measure for the type of autocracy (polity2 score) from the Polity V dataset (Marshall and Gurr, 2020). The polity2 score (theoretically) ranges from −10 till +10. As the scores above 6 are considered to be values corresponding to a democratic political regime, they are hardly observed in our sample. Lastly, we include a dummy variable that controls for the era of the cold war. With the end of the cold war a lot of countries (especially post-communist countries) experienced a structural break in their economic performance. As this structural break correlates with time (as does aging), we include a dummy variable that is equal to one in the period up to 1990 and zero afterwards.[16]

A common problem with an empirical analysis such as ours is the issue of spurious results. In order to address this problem, we re-estimate

[14] The level of secondary school enrollment is taken from the September 2021 update of the Barro-Lee dataset (Barro and Lee, 2013). See: http://www.barrolee.com.

[15] Dataset retrieved from: https://ucdp.uu.se/downloads/index.html#armedconflict.

[16] For most of the regressions, we do not include year fixed effects as they are, conditional on the dictator fixed effects, collinear with age. In table 5, column3, we do control for time fixed effects. This does not alter our main finding.

our empirical model using a placebo regression. The placebo regression works by looking for results where, theoretically, none should be found. In our case, a relevant option for placebo regressions is to focus on democratically elected leaders instead of autocrats. By virtue of the checks and balances in place in a democracy, aging of the leader should not affect the economic growth performance of the country. To this end, we exploit the fact that the database of Bjørnskov and Rode (2020) also contains data on democratically elected leaders that have ruled, or still rule, in 102 countries around the world since 1950. For completeness, using the data of Dreher et al. (2020) once more, we repeat the placebo regression for the sample of democratically elected leaders that left office due to exogenous reasons.

5. Estimation results

We test our hypothesis relating dictator mortality to economic growth in Table 3, where we present the estimation results of the regression model introduced in equation (14). In column 1 we estimate a model in which we include the economic determinants of economic growth as for example used by Barro (1991). In addition, we include the age variable to this specification. As can be observed, all variables have the expected sign. The coefficient for the impact of the age of the dictator on economic growth is −0.079 and is significant at the 1% significance level. In column 2, we test our hypothesis once again, but include the set of political and institutional variables in our estimation equation. The size of the age coefficient changes a little to −0.117 and is still significant at the 1% significance level. The coup variable (as a proxy for political instability) is also very significant and with the expected sign indicating that (indeed) political instability is a determinant of economic growth. Also the cold war dummy is (as expected) negatively and significantly related to economic growth. The coefficient on the polity2 variable is insignificant, possibly because we only include autocracies in the sample. The same holds for the coefficient of the civil war variable. Even though it enters with the expected sign, it is not significantly different from 0. In column 3, we test the impact of the age of the dictator, while we control for all other variables simultaneously. Naturally, this decreases the size of the sample somewhat, but our result remains the same. In column 4, we take the specification of column 3, but drop the insignificant variables sequentially using a general-to-specific approach and test our model down until only significant variables remain. The coefficient for the age variable is now −0.121 and still significant at the 1% significance level. From here onwards, we use this model specification to test the robustness of our results.

In Table 4, we repeat the analysis of Table 3, but now only focus on dictators in our dataset that have dropped from office due to random reasons (i.e., natural death, disease, etc) using the dataset of Dreher et al. (2020). The merit of this approach is that our results cannot suffer from endogenous sample selection (/attrition bias), and hence have a more causal interpretation that the results reported in Table 1. As argued above, our estimation results may well derive from the fact that leaders are more likely to be replaced from office as a consequence of poor economic performance. Therefore, by definition, they would produce the lowest economic growth rates when they are old. We aim to tackle this so-called attrition bias by focusing on a sample of leaders that left office due natural death or a terminal disease, which incapacitated them. Naturally, only 36 leaders actually left office in this way and, therefore, our sample is much smaller relative to our baseline.

Similar to the results in Table 3, we find that the age of the dictator is also very significant for the sample with random leader transitions. In fact, the size of the coefficient is somewhat larger (in absolute terms) than for the larger sample. In our preferred specification (column 4), the coefficient on the age of the dictator is now −0.19.

In Table 5, we report several robustness checks related to the data that we use, as well as the method that we use for estimation. In column 1, we cluster our standard errors per country, whereas in column 2 we use panel random effects. We find that the significance of the coefficient on the age of the dictator is unaffected. In column 3, we include year fixed effects in the analysis. These year fixed effects, of course, correlate somewhat with the age of the dictator, and hence influence the estimate slightly. Yet, the coefficient on the age of the dictator variable is still significant at the conventional 5% significance level. In column 4, we replace our dependent variable and use the variable real GDP growth

Table 3
The impact of the age of the dictator on economic growth.

Dependent variable: economic growth	(1)	(2)	(3)	(4)
VARIABLES	economic controls	political controls	all controls	general to specific
Investment share (% of GDP)	0.061*		0.058	0.064**
	(1.850)		(1.642)	(2.373)
Economic Openness	0.024		0.026	
	(1.183)		(1.242)	
Government spending (% of GDP)	−0.207***		−0.197***	−0.222***
	(-4.601)		(-3.914)	(-5.648)
Human Capital	−0.019		−0.035	
	(-0.423)		(-0.709)	
Population Growth	−0.520**		−0.498*	−0.554**
	(-2.120)		(-1.896)	(-2.536)
Age of the Dictator	−0.079***	−0.117***	−0.119***	−0.121***
	(-3.023)	(-4.443)	(-3.797)	(-4.893)
Political Instability/ Coup d'etat		−2.381***	−1.574**	−2.184***
		(-3.732)	(-2.402)	(-3.696)
Cold War Dummy		−2.947***	−1.885**	−1.195*
		(-3.738)	(-2.093)	(-1.747)
Civil War Dummy		−3.782	−3.951	
		(-1.084)	(-1.209)	
Democracy-Autocracy Score (Polity2)		−0.013	−0.076	
		(-0.181)	(-0.902)	
Observations	3783	4200	3473	4647
R-squared	0.306	0.283	0.293	0.322

Note: Each model specification includes dictator fixed effects. T-statistics are reported in brackets and calculated using robust standard errors. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 4
The impact of "age of the dictator" on economic growth using random leader transitions.

Dependent variable: economic growth	(1)	(2)	(3)	(4)
VARIABLES	rgdppc_gr	rgdppc_gr	rgdppc_gr	rgdppc_gr
Investment share (% of GDP)	0.018		0.048	0.025
	(0.286)		(0.748)	(0.446)
Economic Openness	0.030		0.021	
	(0.811)		(0.578)	
Government spending (% of GDP)	−0.272***		−0.252**	−0.255***
	(-3.260)		(-2.488)	(-3.121)
Human Capital	−0.014		−0.118	
	(-0.110)		(-0.742)	
Population Growth	−1.617***		−1.646***	−1.368***
	(-3.257)		(-3.429)	(-3.242)
Age of the Dictator	−0.152**	−0.196***	−0.251***	−0.190***
	(-1.998)	(-2.737)	(-2.885)	(-2.694)
Political Instability/Coup d'etat		−1.771	−0.514	−1.795
		(-1.276)	(-0.292)	(-1.274)
Cold War Dummy		−4.997***	−3.620*	−2.573
		(-2.878)	(-1.889)	(-1.648)
Democracy-Autocracy Score (Polity2)		−0.195	0.320	
		(-0.433)	(0.690)	
Observations	397	533	394	556
R-squared	0.170	0.066	0.195	0.164

Note: Each model specification includes dictator fixed effects. T-statistics are reported in brackets and calculated using robust standard errors. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 5
Robustness analysis.

Dependent variable: economic growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Country clustered standard errors	Panel random effects	Time fixed effects	WDI gdp growth	Polity index	WDI polstab	No outliers
Investment share (% of GDP)	0.064*	0.064***	0.057**	0.086***	0.078***	0.029	0.062***
	(1.917)	(3.602)	(1.999)	(2.964)	(2.818)	(0.914)	(3.633)
Government spending (% of GDP)	−0.222***	−0.222***	−0.201***	−0.206***	−0.225***	−0.216***	−0.114***
	(-4.717)	(-12.198)	(-4.948)	(-5.510)	(-5.490)	(-3.847)	(-5.447)
Population Growth	−0.554*	−0.554***	−0.586***	−0.463**	−0.514**	−0.471***	−0.570***
	(-1.846)	(-5.630)	(-2.590)	(-1.980)	(-2.191)	(-2.650)	(-5.861)
Political Instability/Coup d'etat	−2.184***	−2.184***	−2.159***	−2.087***	−2.440***		−1.503***
	(-3.651)	(-4.601)	(-3.710)	(-3.112)	(-4.022)		(-3.978)
Cold War Dummy	−1.195	−1.195**	−2.786	−0.422	−1.167*		−0.647
	(-1.160)	(-2.255)	(-0.466)	(-0.576)	(-1.722)		(-1.552)
Age of the Dictator	−0.121***	−0.121***	−0.174**	−0.106***	−0.125***	−0.154***	−0.099***
	(-2.801)	(-5.825)	(-2.009)	(-3.800)	(-4.947)	(-4.285)	(-5.965)
World Bank Political Stability Index						1.230**	
						(2.046)	
Observations	4647	4647	4647	3836	4984	1411	4505
R-squared	0.322	0,322	0.344	0.268	0.304	0.410	0.330

Note: Each model specification includes dictator fixed effects. T-statistics are reported in brackets and calculated using robust standard errors. ***p < 0.01, **p < 0.05, *p < 0.1.

from the World Development Indicators instead. It decreases the size of our sample somewhat, but does not influence our main result. In column 5, we select our sample on the basis of the polity2 definition of democracy and dictatorship (i.e., all political regimes with a polity2 score <7 are considered to be autocracies). The alternative autocracy definition also does not affect our main result. In column 6, we replace the coup d'etat variable for a broader measure of political (in)stability that is provided by the World Bank. This measure (for which higher values indicate more stability) is also highly significant, but does not alter our main result. Lastly, in column 7, we remove some potential outliers from the sample. That is, we re-estimate our baseline model, but omit all growth data that lies in the upper and bottom 1% percentile of the sample distribution. In effect, that implies that we only focus on observed growth rates smaller than 16.55% and larger than −18.03%. The estimated coefficient on the age of the dictator variable shrinks a bit, but is still highly significant.

In Table 6, we address the issue of spurious results by re-estimating our preferred specification but focusing on democratically elected leaders instead of autocratic ones, since for these leaders the checks and balances present in democracies should counteract the age effect. In column 1, we report the estimates for the baseline specification, but now for democracies. In column 2, we use the same specification, but now for the sample of random leader transitions (which admittedly leads to a very small sample). The insignificant coefficient on the *age* variable for both columns indicate that our core finding of a negative relation between aging and economic performance is unique to dictators. When we (in columns 3 and 4) use the polity definition for democracy, the results do not change.

In Table 7, we further zoom in into the origin of our main finding. To do so, we distinguish between different types of political regimes as defined by Cheibub et al. (2010). In column 1, we estimate our model for civilian dictatorships, column 2 has the results for military dictatorships, and column 3 has the results for royal dictatorships. The estimates show that our result is driven by military and royal dictatorships. In columns 4, 5, and 6, we provide more placebo regressions. That is, there we distinguish between different types of democracies. Column 4 shows the estimates for parliamentary democracies, column 5 shows the estimates for mixed democracies (with weak presidents), and column 6 shows the estimates for presidential democracies. For none of the placebo regressions, we find a significant effect of the age of the political (democratic) leader on economic growth.

Table 6
The impact of "age of democratic leaders" on economic growth: placebo regressions.

Dependent variable: economic growth	(1)	(2)	(3)	(4)
VARIABLES	Full sample	Random transitions	Full sample	Random transitions
Investment share (% of GDP)	0.147***	0.222	0.100***	0.320
	(5.895)	(1.477)	(4.133)	(1.382)
Government spending (% of GDP)	−0.183***	−0.357	−0.132***	−0.112
	(-6.819)	(-1.471)	(-4.845)	(-0.441)
Population Growth	−0.107	−3.031	−0.164	−5.861*
	(-0.295)	(-1.414)	(-0.891)	(-1.883)
Political Instability/Coup d'etat	−1.008	−7.117**	−1.449	
	(-1.485)	(-2.043)	(-1.319)	
Cold War Dummy	0.696	−12.326***	1.135*	−12.275***
	(1.486)	(-8.694)	(1.884)	(-9.030)
Age of the Dictator	−0.004	0.029	0.001	−0.060
	(-0.136)	(0.178)	(0.052)	(-0.300)
Observations	4558	114	4259	83
R-squared	0.472	0.690	0.479	0.783

Note: Each model specification includes dictator fixed effects. T-statistics are reported in brackets and calculated using robust standard errors. ***p < 0.01, **p < 0.05, *p < 0.1.

6. Concluding remarks

As dictators grow older, their time horizon decreases. We show in a political-economic growth model that a decrease in the time horizon of a dictator leads to less investments in productive capital and, therefore, less output. This effect is supported by empirical estimates using a sample including over 400 dictators for the period between 1950 and 2019 . Our evidence supports the view that dictators discount the future when it comes to growth promoting policies.

Complementing the growing literature on personal characteristics of leaders and the policies they enact (see, for instance, Besley et al. (2011), Dreher et al. (2009) and Horowitz et al. (2005)), we find evidence that the risk of natural death has an effect on economic growth as well. By means of placebo regressions we show that the found effect is not purely spurious. Moreover, by also focusing on the sub-sample of dictators who left office due to natural causes we are able to establish that the result we

Table 7
The impact of political leader age on economic growth: different political regime types.

Dependent variable: economic growth	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	civilian dictatorships	military dictatorships	royal dictatorships	parliamentary democracies	mixed democracies	presidential democracies
Investment share (% of GDP)	0.030	0.183***	0.006	0.195***	0.196***	0.143***
	(0.700)	(4.608)	(0.142)	(4.086)	(3.868)	(2.970)
Government spending (% of GDP)	−0.331***	−0.076*	−0.221**	−0.212***	−0.258***	−0.208***
	(-5.562)	(-1.892)	(-2.410)	(-2.769)	(-3.202)	(-3.474)
Population Growth	−0.007	0.413	−1.008***	−0.871	1.245	−0.659
	(-0.030)	(0.529)	(-4.257)	(-1.008)	(1.282)	(-1.240)
Political Instability/Coup d'etat	−3.117***	−2.008***	−2.759**	−0.987	−1.007	−0.705
	(-2.725)	(-3.025)	(-1.983)	(-0.483)	(-1.221)	(-0.594)
Cold War Dummy	−0.553	−2.035**	−3.377**	3.523***	−1.306*	1.255*
	(-0.472)	(-2.274)	(-2.324)	(2.736)	(-1.776)	(1.878)
Age of the Dictator	−0.051	−0.180***	−0.189***	0.099	0.012	−0.049
	(-1.463)	(-4.291)	(-3.075)	(1.449)	(0.223)	(-1.106)
Observations	2376	1601	642	1067	1366	1980
R-squared	0.424	0.365	0.219	0.567	0.394	0.488

Note: Each model specification includes dictator fixed effects. T-statistics are reported in brackets and calculated using robust standard errors. ***p < 0.01, **p < 0.05, *p < 0.1.

find is in fact causal.

A caveat of our empirical strategy is that we are not able to differentiate between pure age and pure tenure effects. That is, conditional on the dictator fixed effect, the impact of an increase in age or an additional year of tenure are perfectly collinear. This caveat is confounded by the fact that tenure can potentially influence growth ambiguously. Indeed, tenure may have a negative impact because the dictator could become more skilled at extracting rents from the economy at the cost of additional infrastructural investments. While this mechanism could also be present, our model provides an explanation why dictators may be more inclined to extract rents as they grow older for a given level of rent-extraction ability. Naturally, the impact of aging may be accelerated if dictators become more skilled. However, another stream of research argues that tenure can have a positive effect because the dictator becomes more proficient in managing the economy (see, e.g., Clague et al. (1996)). In practice, both tenure and age will affect growth. Hence, we argue that as long as the estimated coefficient for age is negative and significant (which it in our case always is), this can be interpreted as evidence in favor of our model, possibly accelerated or moderated via a tenure channel.

An interesting direction for future research is to look beyond age and focus on the relationship between other personal attributes of dictators and the policies that they enact. Becker and Mulligan (1997), for instance, argue that, in addition to mortality, wealth, addictions, uncertainty and numerous other variables affect the future time horizon of individuals. Combining their analysis with our empirical strategy and the rich dataset of Ludwig (2004) or Dreher et al. (2020) could shed light on how, for instance, drug and alcohol use affect the enacted policies. Alternatively, a fruitful area for future research is to study how shocks to longevity affect the policies enacted by dictators. Hugo Chavez is an interesting point in this respect and it should be interesting to examine whether his, eventually terminal, cancer diagnose caused a structural break in his economic policies. The most recent leadership transition in North Korea provides an equally interesting case in point where the substitution of an old leader (with a short time horizon) for a young leader (with a longer time horizon) should, according to the theory, lead to an increase in economic growth.

Declaration of competing interest

We have no conflicts of interests.

Math Appendix. Model solution and comparative statics

By substituting the constraints into the utility function we can write the optimization program of a young dictator as[17]

$$\max_{K_2,K_3}\Lambda_1=\ln(AK_1-K_2)+\left(1-\frac{1}{\theta}\mu\right)(1-\pi)\ln(AK_2-K_3)+(1-\mu)\left(1-\frac{1}{\theta}\right)(1-\pi)^2\ln(K_3) \tag{A.1}$$

with K_1 given.

The first order necessary conditions are:

$$\frac{\partial\Lambda_1}{\partial K_2}=0:-\frac{1}{AK_1-K_2}+\frac{\left(1-\frac{1}{\theta}\mu\right)(1-\pi)A}{AK_2-K_3}=0 \tag{A.2}$$

$$\frac{\partial\Lambda_1}{\partial K_3}=0:-\frac{1-\frac{1}{\theta}\mu}{AK_2-K_3}+\frac{(1-\mu)\left(1-\frac{1}{\theta}\right)(1-\pi)^2}{K_3}=0 \tag{A.3}$$

[17] To avoid cluttering the analysis with indices we solve the model in terms of the age of the dictator.

We can rewrite (A.2) and (A.3) as:

$$AK_2 - K_3 = \left(1 - \frac{1}{\theta}\mu\right)(1-\pi)A(AK_1 - K_2) \tag{A.4}$$

$$\left(1 - \frac{1}{\theta}\mu\right)K_3 = (1-\mu)\left(1 - \frac{1}{\theta}\right)(1-\pi)(AK_2 - K_3) \tag{A.5}$$

Defining output growth, g_1, in period 1 as $\frac{Y_2}{Y_1} \equiv 1 + g_1$ and noting that along the growth path $\frac{K_2}{K_1} = \frac{Y_2}{Y_1}$ we can substitute (A.5) into (A.4) to derive:

$$1 + g_1 = \frac{K_2}{K_1} = \frac{A(1-\pi)\left(\left(1-\frac{1}{\theta}\mu\right) + (1-\mu)\left(1-\frac{1}{\theta}\right)(1-\pi)\right)}{1 + (1-\pi)\left(\left(1-\frac{1}{\theta}\mu\right) + (1-\mu)\left(1-\frac{1}{\theta}\right)(1-\pi)\right)} \tag{A.6}$$

Differentiation of (A.6) then gives the results stated in the text[18]

$$\frac{\partial(1+g_1)}{\partial\mu} = \frac{-A(1-\pi)\frac{1}{\theta}}{\left(1 + (1-\pi)\left(\left(1-\frac{1}{\theta}\mu\right) + (1-\mu)\left(1-\frac{1}{\theta}\right)(1-\pi)\right)\right)^2} < 0 \tag{A.7}$$

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[18] In order to derive the comparative static effects, it is instructive to use the pleasant property that for any function of the form $g(x,y) = f(x,y)/(1+f(x,y))$ it holds that $\partial g(x,y)/\partial x = f_x(x,y)/(1+f(x,y))^2 \; \frac{\partial g(x,y)}{\partial} = \frac{f_x(x,y)}{1+f(x,y)}$, which can be shown by a straightforward application of the quotient rule.

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