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journal homepage: www.elsevier.com/locate/jce

Growth-friendly dictatorships

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ARTICLE INFO

Article history:

Received 24 September 2012

Revised 31 August 2013

Available online xxx

Keywords:

Regime type

Capital distribution

Growth

ABSTRACT

De Luca, Giacomo, Litina, Anastasia, and Sekeris, Petros G.—Growth-friendly dictatorships

This research argues that in highly unequal societies, a rent-seeking and self-maximizing dictator may be supported by a fraction of the population, despite the absence of special benefits to these societal groups. Importantly, it is the stakes of the dictator in the economy, in the form of capital ownership, that drive the support of individuals. In highly unequal societies ruled by a capital-rich dictator endowed with the power to tax and appropriate at will, the elites will support dictatorial policies given that they can generate higher growth rates than the ones obtained under democracy. This support arises unconditionally to special benefits to the elites and despite the total absence of checks and balances on the dictator. *Journal of Comparative Economics* xxx (xx) (2013) xxx–xxx. Department of Economics and Related Studies, University of York, United Kingdom & LICOS, KU Leuven, Belgium; University of Luxembourg, Faculty of Law, Economics and Finance, Luxembourg; University of Portsmouth, Department of Economics & Finance, United Kingdom.

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1. Introduction

Unlike democracies, dictatorial regimes centralize the powers in the hands of a single and often corrupt ruler, whose survival hinges on the support of particular societal groups. Accordingly, the policies implemented under dictatorships respond to the incentives of a limited number of individuals, at the expense of the rest of the population.

Despite this misalignment of incentives, dictatorships have recurrently been observed throughout history since the potentially dissatisfied masses often prove unable to translate their disagreement into an effective threat to the central regime. In 2010, one could discern 29 highly authoritarian regimes (negative polity IV score) controlling the lives of more than 2 billion people. Understanding the mechanisms that explain support of societal groups for dictatorships is a challenging task.

This research argues that in highly unequal societies, a rent-seeking and self-maximizing dictator may be supported by a fraction of the population, despite the absence of special benefits to these societal groups. Importantly, it is the stakes of the dictator in the economy, in the form of capital ownership, that drive the support of individuals. In highly unequal societies ruled by a capital-rich dictator endowed with the power to tax and appropriate at will, the elites will support dictatorial policies given that they can generate higher growth rates than the ones obtained under democracy. This support arises

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unconditionally to special benefits to the elites and despite the total absence of checks and balances on the dictator. The support for a dictator is decreasing with the degree of equality in the economy. As a consequence, in mildly unequal societies dictators will adopt more popular policies (less rent seeking and more redistribution) in order to expand their support base, and thereby to contain the risk of transition to democracy.

To unveil the purely economic incentives associated with the support for a dictatorial regime, this research builds on [Alesina and Rodrik's \(1994\)](#) seminal work. In our paper democracy is modeled as in their framework. Namely, the government implements the median voter's preferred policy which can yield inefficiently low growth rates because of the median voter's incentives to implement an over-redistributive policy. We amend [Alesina and Rodrik's \(1994\)](#) model by grafting a self-interested dictator who is entitled to extract any fraction of the tax proceeds he wishes.¹ The dictator then redistributes the tax proceeds net of extraction to the whole population under the form of a productivity augmenting public good. When implementing his policy, however, the dictator lives under a political survival constraint so that dissatisfied citizens will contribute to the democratization of the country.

This simple framework allows for a direct comparison between democracies and dictatorships. When self-interested dictators have strong vested interests in the country's economy, they have incentives to stimulate the economy. This, in turn, grants the dictator the support of a share of subjects who prefer the authoritarian option to the alternative of a democratic polity, that delivers lower growth rates. The dictator's vested interests and the support he collects from some of his subjects are therefore strategic complements, thus implying that more support *or* more capital owned by the dictator are conducive to higher growth rates and to securing the long run survival of dictators.

The contribution of this research lies in describing the fundamental economic incentives behind the support for a dictatorship. We show that in societies featuring a high concentration of capital, and provided the ruling body has high stakes in the economy, part of the capital owners value dictatorship more than democracy. We argue that the persistence of some dictatorships can be rooted in the substantial backing of wealthy capital owners. Since different regimes have different implications for growth, our work suggests that the relationship between capital distribution and growth is both affected and affects the endogenous emergence of political institutions.

1.1. Theoretical contribution

Our study contributes to two broad research questions.

First, we enrich the literature investigating the links between political systems and economic performance. Early on, [Alesina and Rodrik \(1994\)](#) and [Persson and Tabellini \(1994\)](#) established in parallel that unequal societies may constrain economic growth because of the median voter's excessive willingness to redistribute wealth through high levels of taxation when the latter is poorly endowed in capital. These theories therefore predict that in democracies economic growth is an increasing function of the median voter's wealth levels. These models integrally focused on democratic regimes, thus disregarding the consequences of a dictatorial rule. [Olson \(1993\)](#) argues that long-lived dictators with vested interests in the economic performance of the country (i.e. stationary bandits) promote economic growth compared to short lived dictators (i.e. roving bandits). Building on [Olson's \(1993\)](#) work, [McGuire and Olson \(1996\)](#) and [Niskanen \(1997\)](#) compare the economic performance of democracy and dictatorship. Both articles cast aside the question of the endogenous survival of regimes, and both conclude that because of the rent-seeking activity of the dictator, the democratic regime will always outperform the dictatorial one. Our contribution views the survival of dictatorial regimes as an endogenous process that depends on the citizen's support, and the core finding of the paper points at the growth-enhancing nature of some dictatorships. Two recent studies reach similar conclusions to [McGuire and Olson \(1996\)](#) and to [Niskanen \(1997\)](#) even when considering benevolent autocrats ([Shen, 2007](#); [Gradstein, 2007](#)). Studying elitist dictatorial regimes, [Lee \(2003\)](#) shows that when higher tax rates imply lower growth rates, dictatorship always produces lower economic performance than democracy. [Besley and Kudamatsu \(2008\)](#) mainly focus on dictatorial regimes, but do compare democracies to dictatorships and derive the conditions making the latter more preferable in terms of economic growth. Yet, in [Besley and Kudamatsu \(2008\)](#) democracy is conceptualized as the population voting over a dictator and allowing him to appropriate public funds, rather than having checks and balances forbidding a democratically elected leader from acting as a bandit.

Other contributions in the literature of comparative political economy investigate the impact of political institutions on public policies and economic outcomes. [Oechslin \(2010\)](#) focuses on non-democratic regimes and shows that the relationship between tax-revenues and growth may be hump-shaped. The underlying reason is that in the presence of high governmental revenues, the viability of the regime will be jeopardized by potential challengers, thus reducing the current government's time horizon and associated growth-enhancing investments. [Gehlbach and Keefer \(2011\)](#) focus on institutionalized ruling parties as a commitment device used (under some conditions) by autocrats to provide a sound economic environment for investors, thereby reaching democracies' levels of private investment. In comparing long run dynamics of democracies and dictatorships, both [Acemoglu \(2008\)](#) and [Davis \(2010\)](#) demonstrate the superiority of the former. [Acemoglu \(2008\)](#) studies the economic performance of oligarchies (rule by the elite). He argues that while oligarchies may achieve better economic growth in the short run due to a more efficient use of capital, democracies generate better economic outcomes in the long run through the free entry of non-elite individuals into the productive class of capitalists. [Davis \(2010\)](#) suggests institutional

¹ The rent extraction behavior of dictators has been stressed in influential works on dictatorships ([Bueno De Mesquita et al., 2003](#); [Lee, 2003](#)).

flexibility – the ability to adopt and develop new institutions – as a key driver of long term economic growth. The flexibility of democratic decision making sustains the evolution of institutional quality, thus allowing democracies to outperform non-democratic regimes.²

With respect to the existing studies we analyze the individual preferences for a political system depending on the capital distribution in the society. As in the previous literature, we find that a dictatorship is never preferred to a democracy for the society at large, but it grants larger payoffs for capital-rich individuals in societies featuring enough concentration of capital. While the underlying mechanism in our model may to some extent be reminiscent of Osborne and Slivinski's (1996) and of Besley and Coate's (1997) citizen-candidate models, in our setting individuals are faced with the choice of two different regimes. It is indeed the case that both regimes are summarized into one growth rate, yet this growth rate comes with different assumptions as to the structure of the economy. Citizens can either support a democratic regime with all the checks and balances in force, or else they can opt for a self regarding, and thus potentially corrupt, dictator. If the capital distribution is sufficiently skewed, when the dictator proposes a 'platform' his choice may be totally unconstrained: capital-rich citizens prefer backing a rent-seeking – yet growth-friendly – dictator, instead of observing highly redistributive policies under democracy. To our knowledge, this is the first study showing that a share of the population, not benefiting from any special treatment by the dictator and not directly involved in the regime (e.g. as clients, party members, or military bodies), strictly prefers a rent-seeking dictator to democracy. Interestingly this result holds despite the absence of checks and balances on the dictator who, by appropriating public funds, adversely affects the economy.³

The second research question motivating this study concerns the longevity of dictatorships. Scholars have proposed different mechanisms addressing this puzzle, including collective action problems among dissenters (Kuran, 1995; Lohmann, 1994; Acemoglu et al., 2004; Ellis and Fender, 2011), repression (Roemer, 1985; Acemoglu et al., 2010), and politics of co-optation (Wintrobe, 1998; Bueno De Mesquita et al., 2003; Gandhi and Przeworski, 2006; Sekeris, 2011). Acemoglu and Robinson (2001, 2006) and Boix (2003) consider the role of inequality in the stability of authoritarian regimes. While some of our findings resemble theirs, our respective settings differ substantially. More specifically, we derive equilibria where a dictator that embezzles public funds is supported by part of the population. Further, we allow for more general capital distributions.

One of the central findings of our paper according to which a corrupt dictator may receive support from part of the population at equilibrium is similar to the conclusions of Padró i Miquel (2007) who shows that an ethnic (or societal) group may support a dictator even though he impoverishes the country and extracts resources from the ethnic group to which he belongs. The mechanism of the latter paper is labeled the 'politics of fear': an ethnic group would rather be ruled by a corrupt dictator of his own group, than being ruled by a dictator from a different group who would then implement similarly corrupt policies slightly tilted in favor of the opposing ethnic group. Despite these similarities, our frameworks are fundamentally different since the alternative to the corrupt dictator in our framework is a well-behaving democratic regime. Interestingly, the elites in our framework may support the corrupt dictator despite the fact that he does not provide them any special benefits. Moreover, we argue that the channel explaining the support to the corrupt dictator goes through inequality, thereby identifying the detrimental effect inequality on the stability of democracies.

1.2. Empirical evidence

The empirical literature on the impact of political institutions on economic growth is rich and controversial. Early on, Limongi and Przeworski (1993) claimed that the very correlation between the degree of democratization and economic growth could not be clearly established. Similarly, Gehlbach and Keefer (2011) relying on descriptive statistics do not find statistically significant differences between the two types of regimes in matters of private investments. Mulligan et al. (2004) concluded that no systematic differences in matters of economic policies could be discerned between democratic and authoritarian regimes. Two recent studies show a positive impact of democracy on growth (Papaioannou and Siourounis, 2008; Persson and Tabellini, 2009), while Tavares and Wacziarg (2001) show that democratic regimes hamper capital accumulation and reduce economic growth. Finally, Barro (1990b) discerns a non-linear relationship between regime type and economic growth, with dictatorships being associated with intermediate growth rates. In a recent contribution to the debate, Flachaire et al. (forthcoming) establish the existence of two growth regimes, where countries featuring strong (weak) political institutions belong to the low (high) growth group, and their level of economic institutions improves highly (lowly) the growth rate inside the particular growth regime.

Earlier work by Perotti (1996) and Alesina and Perotti (1996) has empirically established the detrimental effect of wealth inequality on growth, mainly because of the political instability generated by inequality. Our theory suggests that inequality is beneficial for growth in an autocratic regime. In order to empirically support our theory, we also provide evidence that (i) among countries experiencing a democratic transition, the higher the inequality levels, the lower the growth rates of the economy, while we equally show that (ii) autocracies featuring higher wealth inequality produce higher growth rates. Whereas the causal link between regime type and growth rate is not clearly identified in our estimations, these findings do strongly support our theoretical findings.

² Both these contributions are compatible with the work of Aghion et al. (2008) according to whom democracy may have a beneficial effect on the productivity and the entrepreneurship of a country, especially when a country's industries are located near their technological frontier.

³ The adverse effect of corruption on the economy has been theoretically and empirically established (Mauro, 1995, 1998; Gupta et al., 1998).

The remainder of the paper is organized as follows. Section 2 presents the formal theoretical model. Section 3 discusses about the link between capital distribution and the support for a dictatorship. In Section 4 we present empirical findings supporting our theory. Finally, Section 5 concludes.

2. The model

Consider an endogenous growth model where the regime type can either be a democracy or a dictatorship. Agents are heterogeneous in their initial endowments of capital and labor. If the regime is democratic, then the median voter is determining the tax rate and thus implicitly the growth rate of the economy. If the economy is ran by a dictator, then the dictator is determining both the tax rate of the economy and the amount of rents that he extracts from the economy. Under both regimes, we assume proportional taxation.⁴ Except for the decision-maker's personal characteristics, we are thus assuming that the only difference between a democracy and a dictatorship lies in the (in) ability of the (former) latter to appropriate public funds.

The regime type in our model is endogenous and depends on the citizen's support for democracy and dictatorship, respectively. Throughout the analysis we follow Acemoglu et al. (2010) in conceiving Democracy as an absorbing state. In the following sections, the structure of the economy is described under both regimes and by comparing them, we derive the implications for the growth rate of the economy and for the endogenous survival of dictatorships which is directly linked to the societal groups that support one regime versus the other.

2.1. Firms

In every time period, there is a number of j identical firms, producing the final good of the economy. Capital and labor are employed as the primary factors of production. Following Barro (1990a) it is assumed that production is further enhanced by public services, G_t , and in addition non-diminishing returns to capital and public services together are assumed, thereby allowing for endogenous growth. Thus, the production function of the representative firm j , is given by

$$Y_{jt}(K_{jt}, L_j) = A_t K_{jt}^a L_j^{1-a} G_t^{1-a}, \quad (1)$$

where A_t is a technological parameter and G_t is the public good provided by the ruler which is financed by taxing individuals in the economy at the rate τ . To save on notation and given that firms are identical, the j subscript is assumed away and similarly the time subscript. In particular

$$G = \theta \tau K. \quad (2)$$

To finance the public good, the ruler taxes proportionally the capital owners at a flat rate τ and the budget is balanced in every time period. If the regime is democratic, it is assumed that the entire tax proceeds are devoted to the provision of the public good. If, however the economy is ruled by a dictator, he extracts a share $(1 - \theta)$ of the tax revenue, and therefore $\theta \tau K$ denotes the remaining fraction of the revenue that is allocated to the provision of the public good.⁵

Factor markets are competitive and therefore individuals are remunerated for their productive factors at the market prices w and r_t , as derived by the following optimization of the firm

$$\max_{K,L} AK^a L^{1-a} G^{1-a} \quad (3)$$

which yields

$$r = aAk^{a-1}G^{1-a} = aA\theta^{1-a}\tau^{1-a} \equiv r(\tau, \theta) \quad (4)$$

and

$$w = (1 - a)Ak^a G^{1-a} = (1 - a)A(\tau\theta)^{1-a}k = \omega(\tau, \theta) \quad (5)$$

after replacing for Eq. (2). Note that $k_t = K_t/L_t$ denotes the per capita capital on the economy. It is also assumed that the aggregate labor endowment in the economy is constant and normalized to unity. The economy's capital and labor income is given by,

$$y^k = (r - \tau)k = (aA\theta^{1-a}\tau^{1-a} - \tau)k \quad (6)$$

and

$$y^l = y - rk = (1 - a)A(\tau\theta)^{1-a}k \quad (7)$$

⁴ The proportional tax assumption is imposed for the model's parsimony. Had we allowed the ruler under dictatorship to tax in a lump-sum manner, the dictator would certainly adopt a more kleptocratic attitude than in the equilibria we derive in this paper.

⁵ This assumption captures the institutional gap distinguishing democracies from non-democracies, as largely emphasized by the literature. More importantly, by relaxing this assumption and allowing for the possibility of a corrupt democratic regime, would further reinforce our main findings associated with the support of the dictatorship by different societal groups.

where the income from capital, y^k , is the income net of taxes and y^s is the income from labor. Note that once spending on the public good is accounted for, then the marginal product of capital, r , is independent from the capital stock thereby excluding the possibility of diminishing returns to capital. In addition, the marginal product of both capital and labor is increasing both in the tax rate τ and decreasing in the extraction rate $1 - \theta$ (increasing in θ), due to the increase in government spending for any given level of k .

In a democratic regime, a tax on capital affects directly the return to capital and therefore affects the incentives of individuals to accumulate wealth. In a dictatorial regime, a tax on capital has the same effect and additionally the incentive to accumulate capital is adversely affected by the extraction rate of the dictator, $1 - \theta$. Similarly, under both regimes a tax on capital is increasing wage income via increases on public good that increase workers' productivity, whereas under a dictatorial regime the extraction rate is adversely affecting the level of wages due to decreases on the level of public good provided.

The national income identity is thus derived by Eqs. (2), (6) and (7),

$$y^k + y^l + \tau k = y \quad (8)$$

where τk is the total revenue from taxes in a democratic regime. In a dictatorial regime it could be more analytically expressed as $\tau k = \tau \theta k + (1 - \theta)\tau k$, where the first term of the RHS denotes the part of the revenue that is directed to the provision of the public good and the second term of the RHS denotes the income extracted by the dictator.

2.2. Individuals

There is a continuum of infinitely lived individuals, whose preferences are defined over consumption. Individuals differ only in their initial capital and labor endowment, and can thus be indexed according to their relative factor endowment, σ_i , defined as

$$\sigma_i = \frac{L_i}{K_i/K} \quad \text{where } \sigma_i \in [0, \infty), \quad (9)$$

where K is the aggregate capital stock of the economy. Capital rich individuals are designated by a low value of σ_i whereas poorly endowed individual (in capital), are designated by a high value of σ_i .

Individuals earn income both from labor and capital. Therefore, from Eqs. (6) and (7) the income of an individual i is given by,

$$y^{k_i} + y^{l_i} = (r(\tau, \theta) - \tau)K_i + \omega(\tau, \theta)K_i\sigma_i.$$

Individuals maximize their intertemporal consumption,

$$\max_{c_i, K_i} \int_0^{\infty} \log(c_i) e^{-\rho t} dt \quad (10)$$

$$\text{s.t. } \dot{k} = (r(\tau, \theta) - \tau)k_i + \omega(\tau, \theta)k_i\sigma_i - c_i \quad (11)$$

where c_i denotes consumption and ρ is the discount rate. Formulating the associating Hamiltonian and optimizing w.r.t. c_i and K_i yields the following optimality condition,

$$\gamma_c = \frac{\dot{c}}{c} = r(\tau, \theta) - \rho - \tau. \quad (12)$$

2.3. The growth rate of the economy

From Eq. (12) and assuming the constancy of τ over time, it is implied that $\gamma_c = \gamma_k = r(\tau, \theta) - \rho - \tau \equiv \gamma(\tau, \theta)$, i.e. all individuals accumulate at the same rate and therefore the growth rate of the economy as a whole is given by,

$$\gamma = aA\theta^{1-a}\tau^{1-a} - \rho - \tau. \quad (13)$$

A direct implication of this is that the relative factor endowment, σ_i will remain unchanged over time and therefore this implies that the median voter, which will be introduced in the following section in the context of a democratic regime, remains unchanged over time.

Consistent with the Alesina and Rodrik's (1994) prediction, the growth maximizing tax rate is obtained as,

$$\{\tau^*\} = \arg \max_{\tau} \gamma = (aA(1-a)\theta^{1-a})^{1/a} \quad (14)$$

thereby implying that,

$$\gamma_{\tau} \geq 0 \quad \text{iff } \tau \leq (aA(1-a)\theta^{1-a})^{1/a}.$$

For low tax rates, the beneficial effect of the public good on productivity is the dominating effect and therefore the growth rate of the economy increases in the tax rate. However, after a critical threshold, further increases in the tax rate distort the incentives to accumulate capital and ultimately the growth rate decreases.

Importantly, whereas in the context of a democratic regime the growth rate is affected only by the tax rate, in a dictatorial regime the incentive of individuals to accumulate capital is adversely affected by the extraction rate, $1 - \theta$ (positively affected by θ). In particular,

$$\gamma_\theta > 0,$$

thereby implying that after taxes have been collected, the appropriation of public funds by a dictator will hamper the productivity-enhancing effect of public good provision. While this is an anticipated outcome, as will be argued later, it will have major implications on determining the societal groups that would favor a dictator as opposed to a democratic regime.

2.4. Tax rate in a democratic regime

Having assumed that democracy is an absorbing state, we begin by deriving the economic equilibrium under such regime. Elections over tax rates are held in each time period and therefore the tax rate is determined by a simple majoritarian rule.⁶ As already argued it is also assumed that under a well functioning democracy, the ruler cannot appropriate public funds and therefore $\theta = 1$.⁷

Given that individuals differ in their initial endowments, the problem that the government has to solve is to find the optimal τ that maximizes i 's intertemporal utility. From Eqs. (10) and (13) it is inferred that along the optimal growth path the instantaneous consumption of an agent i , is

$$c_i^* = [\omega(\tau, \theta)\sigma_i + r(\tau, \theta) - \tau]k_i^* = [\omega(\tau, \theta)\sigma_i + \rho]k_i^* \quad (15)$$

thereby implying that only a fraction, ρ , of his capital stock, k_i^* , is consumed on top of his income from labor $\omega(\tau, \theta)\sigma_i k_i^*$.

Therefore, the ruler in a democratic regime maximizes the following intertemporal utility,

$$\max_{\tau} U_i = \max_{\tau} \int_0^{\infty} \log(c_i) e^{-\rho t} dt \quad (16)$$

$$\text{s.t. } c_i^* = [\omega(\tau, \theta)\sigma_i + \rho]k_i^* \quad (17)$$

and

$$\dot{k}_i = \dot{k} = \gamma(\tau, \theta) \quad (18)$$

Given the constant growth rate of the economy as derived in (13), and the consumption along the optimal path in Eq. (15), Eq. (16) can be expressed as a function of the initial endowment of capital for agent i , k_{i0} ,

$$\max_{\tau} U_i = \max_{\tau} \int_0^{\infty} \log [(\omega(\tau, \theta)\sigma_i + \rho)k_{i0}^{\gamma(\tau, \theta)t}] e^{-\rho t} dt \quad (19)$$

The tax rate that will be chosen by the ruler will not only affect the level of consumption but also the growth rate of the economy. Solving the optimization problem yields the following inequality (which holds with equality at optimality), which implicitly defines the preferred tax rate of individual i ,

$$\tau_i [1 - aA(1 - a)(\tau_i \theta)^{-a}] \leq \rho(1 - a)v_i \quad (20)$$

where $v_i = \omega(\tau, \theta)\sigma_i / (\omega(\tau, \theta)\sigma_i + \rho)$. Importantly, as is evident from Eq. (20), the implicit tax rate is independent of time and therefore is constant over time. It can be easily proved that there exists a unique τ_i and that the single crossing property is verified, thus implying that the median voter theorem is satisfied (see Appendix).

Therefore if m designates the median voter, who is described by his factor endowment σ_m , then the tax rate that would be preferred by the median voter would be implicitly determined by

$$\tau_m [1 - aA(1 - a)(\tau_m)^{-a}] \leq \rho(1 - a)v_m. \quad (21)$$

Importantly, given the constancy of the preferred tax rate over time, the same tax rate will be chosen in every time period. As a consequence, the distribution of individuals with respect to their initial factor endowments will remain unaffected, hence implying that the same individual will remain the median voter across time.

⁶ It is worth noting that allowing for elections to be held on a continuous basis amounts to considering a perfectly functioning democracy that would continuously discipline its elected officials. Moreover, should an alternative scenario be considered where elections are being held at constant time intervals, the outcome of the voting process would have been identical.

⁷ It should be noted that since the ruler is not explicitly modeled, and it is assumed that he acts as a social planner, the optimal rate of θ that would have been chosen by the social planner would endogenously had been set to $\theta = 1$.

2.5. Tax rate in a dictatorial regime

We now extend the analysis to a dictatorial regime so as to compare on the one hand the economic outcomes under both regimes, and, on the other hand, to bring into the picture the endogenous survival of dictatorships.

In a dictatorial regime the ruler is a self-interested dictator who owns in period t a fraction β_t of the total amount of capital of the economy,

$$k_{dt} = \beta_t k_t \quad \text{where } \beta \in [0, 1].$$

The dictator owns no labor and has two sources of income. The first source are the rents from his capital, whereas his second source of income are the rents that he extracts from the total tax revenue, $(1 - \theta_d)\tau_d k$. Therefore in every time period the dictator determines the tax rate τ_d that he will impose on capital as well as the share, $1 - \theta_d$, of the tax proceeds that he will appropriate and consume. We assume that a dictator faces some probability of survival $p(\tau_d, \theta_d)$ which is increasing in the support received by the dictator. It thus follows that $\partial p(\tau_d, \theta_d)/\partial \theta_d > 0$, while for any θ_d , there exists a $\hat{\tau}$ such that $\partial p(\tau_d, \theta_d)/\partial \tau_d \geq 0$ if $\tau_d < \hat{\tau}$, and $p(\tau_d, \theta_d) = 0$ otherwise. Indeed, since the single-crossing property for the tax rate is verified for any θ_d (see Appendix), it follows that for any θ_d the support to the dictator is strictly increasing in τ_d for $\tau_d < \hat{\tau}$, where $\hat{\tau}$ is the threshold value of τ_d above which all citizens prefer the democratic regime to the dictatorship. The survival probability equally depends on a series of modeled parameters (distribution of σ_i, β), as well as unmodeled parameters (strength of the army, organizational capacity of the opposition, terrain, etc.). We shall assume that if the dictator is deposed, the regime permanently switches to democracy.

The dictator maximizes his utility as described by,

$$\max_{\tau_d, \theta_d} U_i = p(\tau_d, \theta_d) \int_0^\infty \log(c_d) e^{-\rho t} dt + (1 - p(\tau_d, \theta_d)) \tilde{V}_d \tag{22}$$

$$\text{s.t. } c_d^* = [\rho\beta + (1 - \theta_d)\tau_d] k^* \tag{23}$$

and

$$\dot{k} = \gamma(\tau_d, \theta_d) = aA\theta_d^{1-a}\tau_d^{1-a} - \rho - \tau_d \tag{24}$$

where c_d denotes the consumption of the dictator under dictatorship, whereas \tilde{V}_d stands for the dictator's discounted lifetime indirect utility under democracy. Two issues should be noted. First, as implied by Eq. (23), along the optimal path under dictatorship, the dictator consumes a fraction $(1 - \theta_d)$ of the total tax revenue, as well as a fraction of his capital stock, $\rho\beta k^*$. Eq. (24) implies that under dictatorship the ruler makes his policy choice by acknowledging that his policy is also affecting the growth rate of the economy. It should also be noted that the growth rate of the economy under a dictatorial regime is the one derived in Eq. (13) with the difference being that the tax rate, τ_d , and the extraction rate, θ_d , are now being determined by the dictator.

Given the constancy of the growth rate of the economy as described in Eq. (24), and given the consumption of the dictator along the optimal path in Eq. (23), Eq. (22) can be expressed as a function of the initial endowment of capital in the economy, k_0 ,

$$\max_{\tau_d, \theta_d} U_d = p(\tau_d, \theta_d) \int_0^\infty \log [(\rho\beta + (1 - \theta_d)\tau_d) k_0^{\gamma(\tau_d, \theta_d)t}] e^{-\rho t} dt + (1 - p(\tau_d, \theta_d)) \tilde{V}_d \tag{25}$$

$$\text{s.t. } p(\tau_d, \theta_d) \in [0, 1]$$

Differentiating w.r.t. to τ_d and θ_d yields the following first order conditions:

$$\frac{\partial U_d}{\partial \tau_d} = p(\tau_d, \theta_d) \left[\frac{(1 - \theta_d)}{(\rho\beta + (1 - \theta_d)\tau_d)\rho} + \frac{\partial \gamma(\tau_d, \theta_d)/\partial \tau_d}{\rho^2} \right] + \frac{\partial p(\tau_d, \theta_d)}{\partial \tau_d} \left[\int_0^\infty \log [(\rho\beta + (1 - \theta_d)\tau_d) k_0^{\gamma(\tau_d, \theta_d)t}] e^{-\rho t} dt - \tilde{V}_d \right] \geq 0 \tag{26}$$

and

$$\frac{\partial U_d}{\partial \theta_d} = p(\tau_d, \theta_d) \left[\frac{-\tau_d}{(\rho\beta + (1 - \theta_d)\tau_d)\rho} + \frac{\partial \gamma(\tau_d, \theta_d)/\partial \theta_d}{\rho^2} \right] + \frac{\partial p(\tau_d, \theta_d)}{\partial \theta_d} \left[\int_0^\infty \log [(\rho\beta + (1 - \theta_d)\tau_d) k_0^{\gamma(\tau_d, \theta_d)t}] e^{-\rho t} dt - \tilde{V}_d \right] \geq 0 \tag{27}$$

2.5.1. Power-secure dictatorships

We first consider the case where the values of τ_d and θ_d that make inequalities (26) and (27) hold with equality are such that constraint on $p(\tau_d, \theta_d)$ is binding, and we denote these optimal values by τ_d^* and θ_d^* , respectively. In other words, we first solve for the problem when $p(\tau_d, \theta_d) = 1$ and $\frac{\partial p(\tau_d, \theta_d)}{\partial \tau_d} = \frac{\partial p(\tau_d, \theta_d)}{\partial \theta_d} = 0$.⁸ The dictator will then implement his first-best policy

⁸ The aim of this approach is to provide a simplifying exposition as to how the policy of the dictator will be affected in case his power is insecure. Therefore whereas we will not, for analytical convenience, lay emphasis on the specific conditions giving rise to such equilibria, we argue that they are more likely to obtain when the dictator's survival probability is highly sensitive to the support of few capital-rich citizens, when the capital endowments in the economy is highly skewed, when the dictator owns much capital, and when the dissenters' capacity to oppose the ruler is hampered by features such as collective action problems, religious and/or ethnic fractionalization, or the faithfulness of the military to the central regime.

and still be power-secure. Combining Eqs. (26) and (27) after setting $p(\tau_d, \theta_d) = 1$ and $\frac{\partial p(\tau_d, \theta_d)}{\partial \tau_d} = \frac{\partial p(\tau_d, \theta_d)}{\partial \theta_d} = 0$, the following expression is derived,

$$\tau_d(1 - a(1 - a)A\tau_d^{-a}\theta_d^{-a}) = 0 \quad (28)$$

Before deriving the explicit formulas for τ_d^* and θ_d^* , it is worth noting that for Eq. (28) to hold, then

$$\tau_d^* = \frac{(a(1 - a)A)^{1/a}}{\theta_d^*}$$

thereby suggesting a complementarity between the decision of the dictator on the tax rate of the economy and the extraction rate. A higher tax rate, τ_d , that hinders growth, and therefore reduces the dictator's income from capital rents, gives him the incentives to extract more from the tax revenue to maximize his consumption. On the other hand, a lower tax rate that boosts growth, increases rents from capital, and therefore the dictator has less incentives to extract rents from the economy. Consistently with the above rationale, his incentive to extract revenue from the economy would be equal to zero, i.e. $\theta_d = 1$, had he chosen the growth maximizing tax rate. As will be shown in the following paragraph, what ultimately affects his policy, is the amount of capital the dictator owns.

Eq. (28) implicitly determines the tax rate and the extraction rate imposed by the dictator. Solving the system of Eqs. (26 and 27), and using Eq. (28), yields the explicit formulas for τ_d^* and θ_d^* , i.e.

$$\tau_d^* = \rho(1 - \beta) + (a(1 - a)A)^{1/a} \quad (29)$$

and

$$\theta_d^* = \frac{(a(1 - a)A)^{1/a}}{\rho(1 - \beta) + (a(1 - a)A)^{1/a}}. \quad (30)$$

Using Eqs. (29) and (30), the following proposition can be deduced.

Proposition 1. *When a dictator is power secure,*

- (i) *The higher a dictator's endowment in capital, β , the lower will be the share of taxes embezzled and the tax rate, thereby yielding a higher growth rate for the economy.*
- (ii) *A dictator owning all the capital, i.e. $\beta = 1$, mimics the growth-maximizing social planner.*

Proof. Part (i) follows immediately from differentiating Eqs. (29) and (30) w.r.t. β , while (ii) follows from setting $\beta = 1$ in Eqs. (29) and (30), and then deducing that $\tau_d^* = \tau^*$, and $\theta_d^* = 1$. \square

The result is both intuitive and fundamental. A dictator who owns a negligible amount of capital, is primarily financing his consumption via extraction. Therefore he finds it optimal to impose a high tax on the economy's capital and to extract a large fraction of the tax proceeds. This course of action does carry for the dictator an intertemporal trade-off, since he has two instruments to balance the returns from rent extraction and growth. A low growth rate which is induced by a high tax rate, can be counterbalanced by higher extraction. Moreover, it should be noted that the less capital the dictator owns, the less important is this source of income for his intertemporal consumption and therefore the lower the incentives to adopt growth-promoting policies.

Conversely, a dictator who owns a large share of the economy's total capital, and whose consumption is therefore primarily financed by rents on the capital he owns, will internalize the adverse effect of extracting a fraction of the tax proceeds on the level of public good, and will therefore lay more emphasis on growth-enhancing policies as opposed to rent-seeking decisions. Therefore, such a dictator will choose a lower tax rate, which will ultimately accelerate the growth rate of the economy.

Pushing the reasoning to the limit where the dictator would be the unique capital owner of the economy yields the First Best outcome, namely he would have an incentive to act as a growth-maximizing social planner.

2.5.2. Power-insecure dictators

When the constraint on the survival probability $p(\tau_d, \theta_d)$ is not binding, the dictator's optimal policy is twisted away from his most preferred policy in order to attract more popular support and improve his odds of survival. We shall denote by $\bar{\tau}_d$ and $\bar{\theta}_d$ the optimal decisions of power-insecure dictators. By a revealed-preferences type of argument, we necessarily have that the second square-bracketed term of (26) and of (27) is positively valued, since the dictator can always fully replicate the policy of a democratic regime. As a consequence, the first square-bracketed term of (26) must be negative. Having shown in the Appendix that the power-secure dictator's utility is concave in τ , it follows that the negative sign of the first square-bracketed term in (26) implies that $\bar{\tau}_d > \tau_d^*$.

Consider next Eq. (27). For any τ , we know that the support to the dictator must be increasing in θ . Formally, $\partial p(\tau_d, \theta_d)/\partial \theta > 0$. It follows that the first square-bracketed term of Eq. (27) is negative at optimality. Since the utility of the power-secure dictator is easily shown to be concave in θ , it follows that $\bar{\theta}_d > \theta_d^*$.

Combining the findings on $\bar{\tau}_d$ and $\bar{\theta}_d$, allows us to state the following proposition:

Proposition 2. *When a dictator is power-insecure, he adopts more popular policies to expand his support among citizens. By containing his rent-seeking and by increasing the tax rate, a power-insecure dictator implements a more redistributive policy.*

2.6. Growth in democracies and dictatorships

In this section we compare the growth rates between a democratic and a dictatorial regime. This will enable us to identify the societal groups that would back a dictatorship instead of supporting a democratic regime. Building upon the previous sections, the following Proposition can be derived.

Proposition 3.

- (i) *In a democratic regime, the growth rate associated with the median voter's policy is always lower than the growth-maximizing tax rate. In a dictatorial regime the growth rate associated with the dictator's policy, is always lower than the growth rate imposed by a dictator who owns the total capital of the economy.*
- (ii) *For any capital endowment of the median voter, k_m , there always exists a sufficiently wealthy dictator such that a dictatorship yields a higher growth rate.*

Proof. If the dictator is power-secure, part (i) follows immediately from setting $\sigma_i > 0$ in Eq. (20) given Eq. (13) and setting $\beta < 1$ in Eq. (29) given Eq. (24). If the dictator is power-insecure, the growth rate will necessarily be lower since $\partial p(\tau_d, \theta_d) / \partial \tau > 0$ at equilibrium.

To show (ii) we simply take the limit of the growth rate induced by the power-secure dictator when $k \rightarrow \infty$. Since at the limit the dictator tends to owning all the capital, he produces the growth-maximizing policy. If the dictator is power-insecure, since $p(0) > 0$ at equilibrium, it is necessarily the case that $\gamma_d^* > \gamma_m$, where γ_m designates the growth rate under democracy. \square

In light of the beneficial effect of the public good on productivity, a positive tax on capital is desirable by all individuals of a democratic society, including individuals owning no labor (i.e. pure capitalists). If a dictator owns all the economy's capital, he will implement a growth maximizing policy provided this leaves him power-secure: his incentives to retain part of the tax proceeds for himself are annihilated since the entire tax collection is operated on the dictator's own capital stock.

Interestingly, once one departs from the limit cases where the median voter is capital-less and the dictator owns the total capital of the economy then we can always conceive a sufficiently wealthy dictator that can generate higher growth rates than a democracy. The direct implication of this result, as will be shown in the next section, is that there can exist a fraction of the society that prefers backing a dictatorship instead of supporting a democratic regime.

2.7. Who supports a dictator?

It is generally argued that most dictatorships are being supported by rich elites. Yet, the common understanding is that these elites are either themselves part of the government, or to the least receive special favors from the regime. In our setting, a dictator's policy maps into support or opposition to the dictatorial regime, and we are thereby able to shed some light on the characteristics conducive to long-lived dictatorships on the one hand, and on the ones likely to favor democratic transitions, on the other hand. In the following proposition we explore the determinants of a power-secure dictatorship and we enquire whether the longevity of some dictators may be explained by the elites' backing.

Proposition 4. *In relatively unequal economies, where the median voter is poorly endowed in capital, a capital rich secure dictator implements a policy generating a higher growth rate than under democracy. Consequently, a fraction of capital-rich individuals is in favor of a dictatorship, thus increasing the regime's security.*

Proof. We first show that the result is valid when $\sigma_m = \infty$, and then relax the assumption so that the median owns some capital.

When setting $\sigma_m = \infty$ and $\beta = 1$, we know that $\gamma_m < \gamma_d$. As a consequence there must exist a $\bar{\beta} < 1$ such that $\gamma_m = \gamma_d$. Distributing $(1 - \beta - \epsilon)k$ to agents endowed with no labor makes them strictly better-off under dictatorship. Moreover, by continuity there exist positive values of labor endowment still making them better-off under dictatorship.

Setting $\beta = 1$, by continuity there exists a finite $\bar{\sigma}$ such that $\gamma_m = \gamma_d$. Reproducing the above reasoning implies that Proposition 4 holds for capital-poor median voters owning strictly positive amounts of capital. \square

Using the above proposition, we deduce that there exist distributions of capital where the dictatorship is preferred by some societal group. Our analysis suggests that highly unequal societies where ruling elites control a significant part of the economy's capital are more prone to the emergence of a long-lived dictatorial regime. We therefore obtain that since the survival of a dictatorial regime depends on power derived from riches (i.e. capital) or power derived from masses (i.e. number of supporters), under both cases the probability of a dictatorial regime is higher in more unequal societies.

Whereas the results of this model support the predictions of [Alesina and Rodrik \(1994\)](#) for relatively equal societies, crucially this is no longer valid as the degree of inequality increases. Increases in inequality suggest that the prevalence of a democratic regime is no longer an outcome preferred by all societal groups, thereby leaving space for the emergence of a dictatorial regime.

[Proposition 4](#) underlines that some citizens would be disposed to totally give up their voting rights and therefore renege on the very existence of checks and balances under some circumstances. When scrutinizing this finding, it is fairly immediate: since both a dictatorship and a democracy yield policies which citizens are unable to influence on their own (except for the dictator), it is not surprising that capital-rich individuals would rather see a growth-friendly dictator, while capital-poor individuals would be in favor of a pro-redistribution 'dictator', i.e. the equivalent to a capital-poor median voter.

Interestingly, in the presence of more equal capital distributions, the support for dictatorships is reduced, hence making dictatorial regimes power-insecure. In such situations we demonstrated that the dictator will set higher taxes, will embezzle less public funds, and will hence implement more redistributive policies so as to improve his survival odds. Nevertheless, in the presence of a capital-poor median voter, such a power-insecure dictator will propose policies conducive to higher growth rates than under a democratic regime.

3. Discussion

The support for the dictator has been shown to depend on the distribution of capital in the society. First, the more endowed an individual is in capital, the more likely it is that he supports a growth-friendly dictator. As long as the dictator's policy ensures a sufficiently high growth rate, the wealthier capitalists of the society will support the dictator. Second, the more capital the median voter owns, the lower the society's support for a dictatorship. The wealthier the median voter in terms of capital, the higher the growth rate implemented under democracy, thus eroding the relative benefits of a dictatorship.

A series of graphs will help visualizing how different distributions of capital map into the support for a dictatorship. On [Fig. 1](#) we draw a Lorenz curve of a hypothetical society for capital. On the x -axis is therefore represented the cumulative share of individuals, while on the y -axis lies the cumulative share of capital. This society is composed of three groups A , B , and C , with increasing capital endowments. Notice that the median voter of this economy belongs to the capital-poor group A . We assume the capital endowment of group C individuals to be such as to make them slightly prefer a growth-friendly dictator to democracy. Therefore, the rest of the society strictly prefers democracy. In this society a dictator would be supported by a share $(1 - \pi_2)$ of individuals owning a share $(1 - \beta - \kappa_2)$ of the economy's total capital.

On [Fig. 2](#) we increase the level of inequality of this society by transferring part of group A 's capital to group B individuals, for them to match group C capital-endowments. This capital redistribution has two effects. First, it aligns the regime preferences of group B and group C individuals. Second, it reduces the capital endowment of the median voter, thereby reducing the growth rate under democracy. As a consequence under this new configuration a share $(1 - \pi_1)$ of the society (or the owners of share $(1 - \kappa'_1)$ of capital) will be pro-dictatorship. While it is speculative to identify the critical support for the emergence of a dictatorship, an increase of inequality in capital ownership strengthens the backing of a dictatorship which feeds back into more power-secure dictatorships, eventually incentivizing dictators to implement even more growth friendly

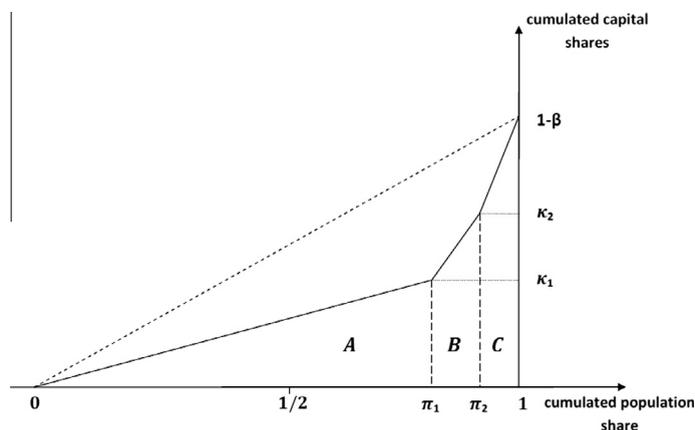


Fig. 1. Physical capital Lorenz curve: who supports a dictator?.

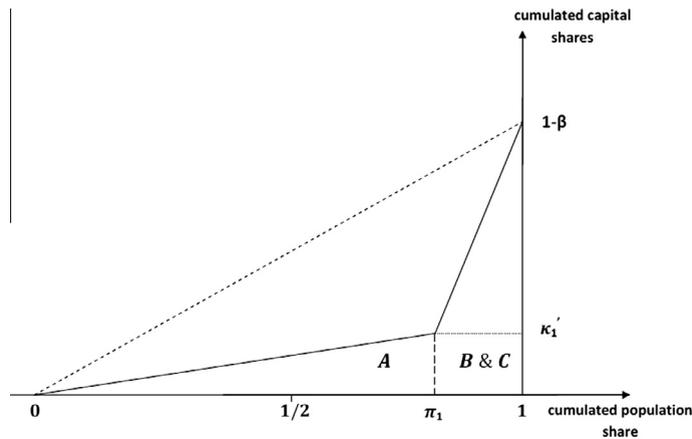


Fig. 2. Physical capital Lorenz curve: relatively poor median voter.

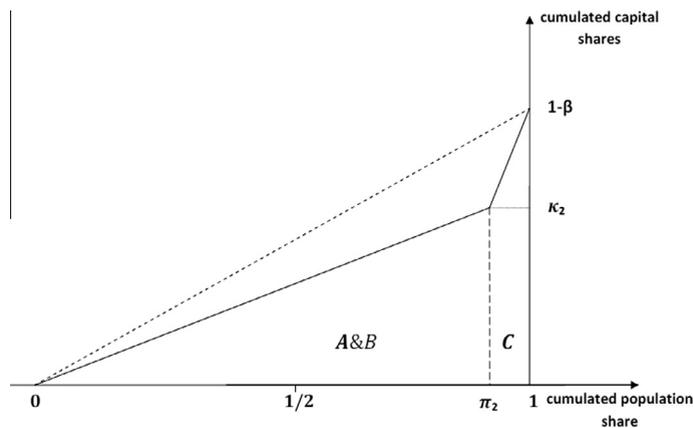


Fig. 3. Physical capital Lorenz curve: relatively rich median voter.

policies. A very unbalanced distribution of wealth may therefore have favored the emergence of some relatively stable dictatorships (e.g. the experiences of Chile and Singapore).

In Fig. 3, we pool the capital endowments of Groups A and B as given in Fig. 1. This inequality-reducing transfer increases the capital ownership of the median voter, thereby increasing the growth rate under democracy. Since Group C was weakly preferring dictatorship prior to the transfer, nobody will support the dictatorship after this transfer. A relatively prosperous middle class characterizing economically developed societies inhibits the emergence of a pro-dictatorship coalition.

4. Empirical findings

We now provide empirical support for the theory developed in this manuscript, by looking at the impact of democratization on economic growth, while accounting for levels of income inequality, and we then provide evidence that autocracies featuring higher wealth inequality produce higher growth rates.

We employ the sample of Papaioannou and Siourounis (2008) to relate our argument to the existing empirical literature. The latter paper explores the effect of democratization on growth, using an index of democratization that captures the transition from an autocratic regime to a democratic one. The democratization variable takes the value 0 for autocracies, and if democratization takes place, the variable takes the unit value. Column 1 of Table 1 partly replicates their analysis by exploring the effect of democratization on growth. The analysis employs country and year fixed effects, thereby estimating the effect of democratization on the growth rate within a particular country. To produce simple correlations that illustrate our theoretical argument, we introduce in the analysis a control for the level of inequality (the share of income held by the wealthiest 20% of the population) as well as the interactive term of inequality and democratization.

The results suggest the following. The coefficient on democratization is positive, in accordance with the results of Papaioannou and Siourounis, suggesting that democratization is good for growth. The coefficient of inequality on growth is inconclusive, reflecting perhaps the fact that the literature is inconclusive as to direct effect of inequality on growth.

Table 1
Regime type, inequality, and growth.

	(1)	(2)
	Dep. var: growth rate	
Democratization (DEM)	15.271** (7.020)	
Autocracy (AUTO)		−1.167* (0.702)
Inequality	−0.005 (0.092)	−0.192 (0.112)
Interaction DEMxInequality	−0.264** (0.116)	
Interaction AUTOxInequality		0.023* (0.013)
Time Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes
Observations	514	514
Countries	129	129
Years	26	26
R-squared	0.113	0.0916

Summary: This table illustrates that the adverse effect of autocracy on growth rates is mitigated in the presence of inequality. *Notes:* (i) DEMOC is the index of democratization constructed by Papaioannou and Siourounis (2008). The index takes the values 0 for autocracies and the value 1 for a country that moved from autocracy to democracy; (ii) AUTO is the autocracy index provided by the Polity dataset. It takes values from 0–10, where 0 indicates democracies whereas 10 is assigned to the most autocratic regimes; (iii) Inequality is proxied by the income share held by the highest 20%, a measure provided by the world bank; (iv) robust standard error estimates are reported in parentheses.

* Statistical significance at 10% level for two-sided hypothesis tests.

** Statistical significance at 5% level for two-sided hypothesis tests.

*** Statistical significance at 1% level for two-sided hypothesis tests.

Critically though the sign of the coefficient of the interactive term is negative and significant. This suggests that after democratization has taken place, the positive effect of democratization on growth is mitigated by the presence of inequality.

This is a first sign of evidence towards our hypothesis as to the mediating effect of inequality. However this approach, i.e. using the democratization measure, does not allow us to capture the effect of inequality in the context of a non-autocratic regime, neither to capture the degree of autocracy.

To this end, in Column 2 of Table 1 we use instead the measure of autocracy from the Polity IV dataset which captures the presence or not of an autocracy as well as the intensity of the autocratic regime.⁹ Whereas this is not a direct measure of the capital endowment of the dictator, it could be used as a proxy under the identifying assumption that the close circle of elites directly controlling the country (the dictator and his acolytes) is therefore likely to be wealthy, either because of their endowments, or because of the wealth they appropriated on their path to power. Interestingly, the correlations in Column 2 further illustrate our argument. In particular, the negative coefficient on the measure of autocracy reflects the partial effect of autocracy on growth, namely that autocratic regimes are associated with lower growth rates, a result that accords well with some of the literature mentioned above. The coefficient on inequality is insignificant, again potentially reflecting the inconclusiveness of the direct effect. However, the coefficient on the interactive term is positive and significant. Depending on the degree of inequality, this result yields three different conclusions. First, the negative effect of autocracy on economic outcomes is mitigated by the presence of inequality. Second, the partial effect of inequality on growth rate is positive in the presence of an autocratic regime. The more autocratic the regime is, the stronger the positive effect of inequality on the growth rate, a result that is potentially capturing the fact that in the presence of inequality more autocratic regimes are choosing more growth-enhancing policies. More importantly, for sufficiently high values of inequality (e.g. if the income held by the richest 20% of the population is more than 51% of the total income), then the total effect of autocracy on growth may become positive.

The above interpretations rely on mere correlations. A careful empirical analysis, which is beyond the scope of this paper, would require employing a dynamic panel analysis and properly addressing potential endogeneity issues. Yet we view these correlations as first evidence of the fact that inequality is a critical mediating factor that can affect the stability of a democratic regime by affecting economic activity and thus the interests of a fraction of the population.

5. Concluding remarks

In this paper we show that different societal groups may support a rent-seeking dictator serving their interests better than the median voter would in a democratic regime. Importantly, when a dictator's support base is sufficient to leave

⁹ In the original dataset, the variable ranges from −10 to +10 in the pre-2000 period, and from 0 to +10 in the post-2000 period. We normalized the index over the whole period on a 0–10 scale.

him power-secure, support for a dictator is not granted in exchange of individual benefits (e.g., special treatment by the dictator as clients, party members, or military bodies), nor is it the result of coercion and fear. Wealthy elites are inclined to back an almighty and long lived dictator because of the growth-promoting policies that are likely to be implemented. Since this backing and the dictators' policy are strategic complements, and both impact on the determination of the equilibrium growth rate, these actions tend to re-inforce each other and to allow for higher growth rates at equilibrium. The distribution of capital in the society and the stakes of the dictator in the economy, in the form of capital ownership, directly shape the preferences of individuals over the political system: in societies featuring a high concentration of capital and a dictator endowed with enough capital, part of the capital owners eager to see the economy grow value dictatorship more than democracy. We argue that the persistence of some dictatorships can be rooted in the substantial backing of wealthy capital owners. Less unequal societies weaken dictators who, faced with increased power insecurity, are compelled to implement more popular redistributive policies while equally reducing the embezzlement of public funds for their own consumption. Finally, we show that the support for a dictator is decreasing with the capital ownership of the median voter.

Acknowledgments

The authors thank Jan Fidrmuc, Kai Konrad, Nils Metternich, Fabien Prieur, Raphael Soubeyran, Jo Swinnen, and Michele Valsecchi for their valuable comments. The paper has significantly improve thanks to the comments and advices of two anonymous referees and of the editor. Petros Sekeris acknowledges the financial support from the Belgian National Research Fund (FNRS).

Appendix A. Proof of uniqueness of tax rate, τ_i

The optimal tax rate is implicitly derived by Eq. (20). Setting Eq. (20) equal to zero as implied by the optimality condition, and differentiating with respect to τ , implies that the objective function is concave in τ iff

$$1 - aA(1-a)^2(\tau_i\theta)^{-a} - \frac{aA(1-a)^3\rho^2\sigma_i(\tau_i\theta)^{-a}}{[\omega(\tau, \theta)\sigma_i + \rho]^2} > 0$$

Rearranging terms, this expression can be written as

$$\left[1 - \frac{(1-a)\rho}{\omega(\tau, \theta)\sigma_i + \rho}\right]\tau[1 - aA(1-a)(\tau_i\theta)^{-a}] + a^2A(1-a)^2(\tau_i\theta)^{-a} > 0$$

Since both terms of the expression are positive the inequality is necessarily satisfied. It is then straightforward to compute $\frac{\partial^2 U}{\partial \tau_i \partial \sigma_i}$ and to verify that the single crossing property is verified, thus implying that the median voter theorem applies.

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