



The effects of economic development on democratic institutions and repression in non-democratic regimes: theory and evidence

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Abstract

This paper provides a theoretical rationale for the simultaneous use of repression and democratic institutions by a non-democratic government, as is often observed in reality. We find that economic development has different impacts on the levels of repression and democracy, depending on whether it appears in the form of rises in income or in education: A higher income level reduces democracy, whereas more education leads to both more democracy and more repression. These theoretical implications are corroborated by dynamic panel data regressions.

Keywords Democracy · Repression · Non-democratic government · Economic development

JEL Classification: C33 · D72 · K38 · H11 · O10

1 Introduction

Government violations of human rights like political imprisonment, torture, and killings are widespread. At least in recent history, state repression is estimated to have claimed more lives than other forms of political conflict (Rummel, 1997).

Against this background, many empirical studies have aimed to identify determinants of state repression. One important finding of this literature is that the relation between repression and democracy is far from monotonous. While full democracies are generally less repressive than full autocracies, some studies find anocracies, i.e. regimes characterized by a mix of democratic and autocratic institutions, to show higher levels of repression than full autocracies and full democracies (see, e.g., (Fein, 1995; Regan & Henderson, 2002)). While these “more murder in the

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middle”-results have been challenged for being driven by conceptual overlaps between indicators of repression and democracy (Hill Jr, 2016; Vreeland, 2008), consensus prevails that only fully democratic political regimes are associated with a substantial reduction in human rights violations (Davenport and Armstrong, 2004; Bueno De Mesquita et al., 2005; Jones & Lupu, 2018).

This finding suggests that the institutions of democracy have to be sufficiently strong to constrain political leaders effectively. But by the same token, democratic institutions in autocratic regimes should be considered as instruments of the ruling elite. In particular, they can reflect policy concessions made by non-democratic governments aimed at preventing rebellion (Gandhi & Przeworski, 2006). Consequently, trying to explain differences in repression levels between non-democracies by differences in their institutional structures is not conducive, as the latter are not exogenous. Rather, both repression and political institutions have to be interpreted as tools of non-democratic leaders, with their utilization depending on other underlying factors.

This paper provides a closer examination of the determinants of repression and democratic political institutions in non-democratic political regimes. We present a simple theoretical model based on a non-democratic leader caring for both private consumption and political power, which is able to explain the concomitant use of repression and democratic concessions. This model predicts different facets of economic development to have different implications for human rights violations and democracy levels: While higher income levels are associated with lesser democratic concessions, an increase in the educational attainment of the population increases both repression and democracy. Using data on 458 non-democratic political leaders of 101 countries in the period from 1950 to 2010, these implications are confirmed by dynamic panel data estimations.

2 Repression, democracy, and economic development

The political economy literature agrees broadly that repression is an essential instrument of non-democratic rulers to secure office. From a theoretical perspective, Wintrobe (1990, 1998) argues that the extent of repression depends crucially on the preferences of the political leader. To save budget, a “tinpot” dictator who is exclusively interested in maximizing private consumption applies the minimum level of repression required to stay in office. On the contrary, a “totalitarian” who is interested in maximizing power over the population exerts higher levels of repression.

Non-democratic rulers do not survive by using repression alone. To prevent rebellion, autocrats can also provide economic benefits through reduced taxes, subsidies, and public investment (see, e.g., (Acemoglu & Robinson, 2005; Bar-El, 2009; Grossman, 1995; Gwatipedza & Janus, 2018)). As shown by Desai et al. (2009), those economic benefits may be strategically complemented by policy concessions. Acemoglu and Robinson (2000) highlight that concessions in terms of political rights are not necessarily effective, as they may be viewed as a sign of weakness and therefore spur a revolution. Then, the ruling elite may go for either large-scale repression or full-scale democratization instead of an intermediate option. However, despite endorsing

historical examples by Acemoglu and Robinson (2000), quantitative evidence suggests that the partial implementation of democratic institutions by non-democratic leaders generally prolongs their survival by broadening their basis of support (Gandhi & Przeworski, 2007). More specifically, popular support may be generated by policy concessions, which require an institutional setting of legislatures and parties (Gandhi & Przeworski, 2006).

Obviously, the significance of such concessions depends on the preferences not only of the leader, but also of the population. Acemoglu and Robinson (2005) argue that instrumental demands for democratization can be grounded in the desire to redistribute income by enforcing the preferences of the (poor) median voter. Moreover, democracy may be intrinsically valuable for citizens. According to modernization theory (Lipset, 1959), economic development in general and education in particular are related to sustaining belief in democratic norms and higher demand for political participation. Modernization theory thus establishes a causal link from economic development to democracy. The empirical validity of this hypothesis has been challenged, with some authors positing that causality runs in the other direction (see (Acemoglu et al., 2008, 2019)). Despite extensive examination, evidence on the modernization hypothesis has remained inconclusive (see, e.g., (Cervellati et al., 2014; Castelló-Climent, 2008; Lundberg et al., 2016; Moral-Benito & Bartolucci, 2012)).

Although there is no clear link between general economic development and democracy at the macro-level, the link between education and democratic preferences appears to be robust at the micro-level. More educated citizens are found to be more likely to form democratic values and show demand for political participation, also when living under non-democratic political regimes (see, e.g., (Chong & Gradstein, 2015; Evans & Rose, 2007, 2012)). As an explanation, Chong and Gradstein (2015) propose that an individual's costs of monitoring politicians decrease in the level of education. Consequently, educated citizens are more likely to support democratic practices and institutions which can promote the accountability of political leaders. In this regard, the role of income is less clear-cut. There is some evidence that citizens belonging to the high-income group tend to support democracy to a lesser extent than those belonging to the low-income or medium-income group (Shafiq, 2010). This finding is in line with the notion that political support is at least in part instrumental and, hence, depends on economic wellbeing.

Based on these considerations, the model developed in the following section comprises both the rationale of non-democratic political leaders and a more differentiated perspective on the link between economic development and political support.

3 The model

In the spirit of Wintrobe (1990, 1998), we consider a non-democratic leader L , whose utility depends on her level of political power p and private consumption c :

$$U_L = u(p) + v(c), \quad (1)$$

where $u(\cdot)$ and $v(\cdot)$ are well-behaved concave functions ($u' > 0 > u''$, $v' > 0 > v''$), ensuring interior solutions for the sake of convenience.

The level of L 's political power is considered as the extent to which she can act at her own discretion. Obviously, democracy erects institutional constraints on this power due to a constitution, an independent legislature, modes of political competition, etcetera. Thus, we express political power as: $p = \bar{d} - d$, with \bar{d} as some maximum degree of democracy viable for an autocratic regime and $d \in [0, \bar{d}]$ as the democracy level actually provided.

Private consumption c equals L 's budget B net of repression expenditures r required to stay in power described in detail below: $c = B - r$. In order to raise her budget, L taxes the gross income of the economy y at a tax rate τ .¹ The relation between tax rate and revenue is of a Laffer-type: $B = q(\tau) \cdot y$ with $q'(0) \in (0, 1]$, $q''(\tau) < 0$, and $q'(\hat{\tau}) = 0$, $\hat{\tau} \leq 1$. The budget increases with the tax rate less than proportionally and only up to some threshold rate $\hat{\tau}$.

Superseding autocratic L necessitates a rebellion. Here, we follow Bar-El (2009) by assuming that the mobilization potential for insurgence increases in the discontent of the general population. However, we extend that approach by positing that not only economic but also political issues matter for dissatisfaction.² Let the utility of the general population be denoted by:

$$U_p = w((1 - \tau)y) + s(d - e, r),$$

where w and s capture economic and political satisfaction, respectively. While economic satisfaction is related positively to disposable income $(1 - \tau)y$ according to a well-behaved concave function ($w' > 0 > w''$), two factors enter political satisfaction: the difference between supply and demand for democracy and the prevailing level of repression r . In line with the modernization theory of Lipset (1959), demand for democracy is represented by the level of education e , which diminishes the utility from the actual democracy supply level d . For the sake of concreteness, we assume:

$$s(d - e, r) = g(d - e) - r,$$

where $g(\cdot)$ is also well-behaved ($g' > 0 > g''$).

Like in Bar-El (2009), members of the general population are assumed to disapprove of L and mobilize when utility falls below their threshold levels. Moreover, these threshold levels follow a uniform distribution in some interval $[\underline{U}, \bar{U}]$, with \underline{U} and \bar{U} reflecting the most servile and critical attitudes towards L , respectively. Consequently, the share of the general population dissatisfied with L and receptive for rebellion amounts to:

¹ Throughout the analysis, we treat both income and education as exogenous variables which are not interrelated. See the Conclusions section for a discussion of this assumption. Moreover, we normalize population size to unity for convenience. Hence, y denotes both total and per capita income.

² In Bar-El (2009), utility functions of citizens are defined over private consumption only. The same applies to the leader, who does not derive utility from political power per se. Similar assumptions hold in Acemoglu and Robinson (2000).

$$N = 1 - \frac{w((1 - \tau)y) - r + g(d - e) - \underline{U}}{\bar{U} - \underline{U}}, \tag{2}$$

In order to prevent the mobilization of N and maintain office, L must exert repression. Thus, letting $\phi > 0$ denote the per capita cost of containing the dissatisfied, $r = \phi \cdot N$ must hold. However, according to (2), repression contributes itself to political dissatisfaction: with each additional unit devoted to r , the number of dissatisfied rises by $1/(\bar{U} - \underline{U})$, each on whom ϕ must be spent. This implies that from each unit of r , only the share $1 - \phi/(\bar{U} - \underline{U})$ remains for tackling economic and democratic discontent. In what follows, we posit that this share is positive, such that r is an effective instrument in addressing dissatisfaction. This effectiveness is ensured by the condition: $\phi/(\bar{U} - \underline{U}) < 1$.³ Then, the expenditures required to curb rebellion amount to:

$$r = \varphi \cdot (\bar{U} - w((1 - \tau)y) - g(d - e) > 0), \tag{3}$$

with $\varphi = \phi/(\bar{U} - \underline{U} - \phi) > 0$ for notational convenience. According to (3), improving satisfaction by reducing taxes and/or providing more democracy saves on repression expenditures. However, democracy decreases political power and lower taxes reduce L 's budget.

Thus, the problem of L is to choose the level of democracy and the tax rate in order to maximize utility subject to the requirement that the disapproved are contained. In formal terms:

$$\max_{d, \tau} u(\bar{d} - d) + v(q(\tau)y - r), \tag{4}$$

with r given by (3). This leads to first order conditions:

$$d : -u'(\bar{d} - d) + v'(q(\tau)y - r) \cdot \varphi \cdot g'(d - e) = 0, \tag{5}$$

$$\tau : v'(q(\tau)y - r) \cdot y \cdot [q'(\tau) - \varphi \cdot w'((1 - \tau)y)] = 0. \tag{6}$$

Implicit differentiation yields:

$$\frac{d\tau}{de} = 0 \tag{7}$$

$$\frac{dd}{de} = \frac{\varphi^2 \cdot v''(g')^2 + \varphi \cdot v'g''}{u'' + \varphi \cdot v'g'' + \varphi^2 \cdot v''(g')^2} > 0, \tag{8}$$

³ For $\phi/(\bar{U} - \underline{U}) > 1$, repression would be generally ineffective: each unit spend on r would require spending more than one unit to make up for the self-inflicted political discontent. Thus, the other reasons for dissatisfaction could not be handled by exerting repression at all.

$$\frac{d\tau}{dy} = \frac{\varphi \cdot w'' \cdot (1 - \tau)}{q'' + \varphi \cdot w'' \cdot y} > 0 \quad (9)$$

$$\frac{dd}{dy} = - \frac{\varphi \cdot v'' g' \cdot (q + \varphi \cdot w' \cdot (1 - \tau))}{u'' + \varphi \cdot v' g'' + \varphi^2 \cdot v'' (g')^2} < 0. \quad (10)$$

A more educated population has no consequences on the tax rate, but leads to more democracy, whereas a higher per capita income increases the tax rate and weakens democratic institutions. Moreover, by (8–10), repression grows with the level of education, but reacts ambiguously on a per capita income increase:

$$\frac{dr}{de} = \varphi \cdot g' \cdot \left(1 - \frac{dd}{de}\right) = \frac{\varphi \cdot g' u''}{u'' + \varphi \cdot v' g'' + \varphi^2 \cdot v'' (g')^2} > 0 \quad (11)$$

$$\frac{dr}{dy} = -\varphi \left(w' \cdot \left(1 - \tau - y \cdot \frac{d\tau}{dy}\right) + g' \cdot \frac{dd}{dy} \right) \quad (12)$$

$$= -\varphi \left(\frac{q'' w' \cdot (1 - \tau)}{q'' + \varphi \cdot w'' \cdot y} - \frac{\varphi \cdot v'' (g')^2 (q + \varphi \cdot w' \cdot (1 - \tau))}{u'' + \varphi \cdot v' g'' + \varphi^2 \cdot v'' (g')^2} \right) \geq 0. \quad (13)$$

These findings can be interpreted as follows. Encouraging demands for democracy, a rising level of education increases dissatisfaction among the general population unambiguously. L minimizes her utility loss of containment by sacrificing both private consumption and political power. This entails not only combating dissatisfaction by increasing repression [$\frac{dr}{de} > 0$], but also mitigating discontent by offering more democracy [$\frac{dd}{de} > 0$]. However, a rising per capita income has an inconclusive effect on dissatisfaction. On the one hand, rises in per capita income lead to higher disposable income [$d(1 - \tau)y/dy = 1 - \tau - y \cdot d\tau/dy > 0$], which reduces economic dissatisfaction. On the other hand, it increases L 's budget [$dB/dy = q + q' \cdot y \cdot d\tau/dy > 0$] which spurs her demand for both private consumption and political power. Thus, democracy is dismantled [$\frac{dd}{dy} < 0$] and political dissatisfaction grows. As a consequence, economic and political discontent move in opposite directions, leaving the impact on overall dissatisfaction and hence on repression expenditures ambiguous [$\frac{dr}{dy} \geq 0$].

Summarizing, the model predicts a non-democratic leader to respond differently to economic development in terms of income and in terms of education, allowing us to investigate the following hypotheses:⁴

⁴ As our theoretical result on the relation between r and y is ambiguous, we abstain from a fully-fledged empirical examination. However, we report respective regression results in Tables 1, 2, 3. Moreover, lacking tax rate data prevent us from testing the effects of income and education on τ .

Table 1 System GMM estimates of (14)

Model	(1)	(2)	(3)	(4)
Dependent variable	Democracy _{it}		Repression _{it}	
Education _{it-1}	6.47*** (1.88)	3.16*** (1.02)	3.78** (1.91)	5.03** (2.07)
log(GDP/capita _{it-1})	- 14.14*** (4.40)	- 9.77*** (3.72)	- 3.85 (3.65)	- 5.72 (5.28)
log(Population _{it-1})	- 0.87 (0.85)	- 0.42 (0.50)	5.73*** (0.87)	4.41*** (0.92)
Age structure _{it-1}	[0.13]	[0.31]	[0.03]	[0.02]
Minor conflict _{it-1}		0.13 (1.45)		11.68*** (2.41)
Intrastate war _{it-1}		- 0.77 (1.57)		17.51*** (4.06)
Urbanization _{it-1}		0.17* (0.09)		0.09 (0.11)
log(Population density _{it-1})		- 0.02 (0.56)		1.18 (0.95)
Ethnic fractionalization _{it-1}		- 0.93 (3.33)		- 2.09 (6.09)
Religious fractionalization _{it-1}		- 2.77 (3.09)		- 6.77 (6.11)
log(Resources/capita _{it-1})		0.21 (0.18)		0.27 (0.23)
Regime durability _{it-1}		0.01 (0.04)		0.13** (0.06)
Leader age _{it-1}		0.01 (0.04)		- 0.08 (0.07)
Dependent variable _{it-1}	0.93*** (0.07)	0.87*** (0.07)	0.35*** (0.05)	0.33*** (0.05)
<i>Long-run effects</i>				
Education: 5 years	27.9***	12.08***	5.81**	7.50**
log(GDP/capita) : 5 years	- 60.94***	- 37.33**	- 5.91	- 8.53
Education: 10 years	46.86***	17.93***	5.84**	7.53**
log(GDP/capita) : 10 years	- 102.30**	- 55.42**	- 5.95	- 8.57
Observations	3,609	2,847	1,727	1,557
Countries	92	90	85	85
Years	60	49	29	29
Leaders	541	385	257	219
Instruments	111	119	111	119
AR1	[0.00]	[0.00]	[0.00]	[0.00]
AR2	[0.89]	[0.77]	[0.17]	[0.30]
Hansen J-test	[0.58]	[0.82]	[0.77]	[0.99]
Diff-in-Hansen test	[0.60]	[0.68]	[0.94]	[0.18]

Dependent variables: Democracy (Polity scores) and Repression (reversed PIR scores)

Standard errors are clustered by country and shown in parentheses. *p*-values are in square brackets. Significance levels: *10%, **5%, ***1%. The sample includes non-democratic regimes defined by a Polity score ≤ 5

H_d^y : A higher per capita income is associated with a lower level of democracy.

H_d^e : A higher level of education is associated with a higher level of democracy.

H_r^e : A higher level of education is associated with a higher level of repression.

4 Empirical evidence

To test the hypotheses derived above, we utilize the Archigos data set of political leaders (Goemans et al., 2009). The office entry and exit dates reported in the Archigos data allow us to match political and economic conditions to non-democratic rulers. In contrast to previous empirical analyses at the country level, we therefore can exploit changes in political institutions and repression within the tenure of a specific leader. Furthermore, this approach enables us to control for leader-specific characteristics (see below).

Our dependent variables are Democracy and Repression, measured by two commonly used indicators (see, e.g. (Acemoglu et al., 2008; Heid et al., 2012; Hill & Jones, 2014)). For democracy we take the “Polity scores” (Marshall & Gurr, 2016), which measure a country’s level of democracy in discrete steps between -10 (full autocracy) and 10 (full democracy). Repression is operationalized by the “Physical Integrity Rights Index” (PIR) of the CIRI Human Rights Data Project (Cingranelli et al., 2014). The PIR captures human rights violations including torture, extrajudicial killing, political imprisonment, and disappearance on a scale ranging from 0 (no government respect for the related human rights) to 8 (full government respect for the related human rights). To measure repression, we reverse the signs of the PIR scores. Furthermore, both the Polity and the reversed PIR scores are normalized between 0 and 100 to facilitate the interpretation of the regression results presented below.

Income is represented by (the logarithm of) GDP per capita retrieved from the Penn World Table 9.0 (Feenstra et al., 2015). The GDP data are expressed in mil. 2011 US\$ purchasing power parities to avoid distortions due to price and exchange rate fluctuations. Education is measured by the average years of schooling of the population aged 25 and over (Barro & Lee, 2013). Since the schooling data are available only in 5-year intervals, we apply linear interpolation.

Our econometric baseline specification closely follows Acemoglu et al. (2008) and includes (the log of) population and age structure as controls. Population is given by the country’s number of inhabitants. Age structure is represented by the median age and the fraction of the population in the age groups 0-15, 15-30, 30-45, and 45-60. All of these data are from United Nations Population Division (2017).

To assess the robustness of our results, a second specification additionally includes other control variables employed in the literature on democracy and state repression. To capture effects of domestic violence, we include two dummy variables from the UCDP/PRIO Armed Conflict Dataset (Allansson et al., 2017;

Gleditsch et al., 2002) representing “minor” conflicts (between 25 and 999 battle-related deaths in a given year) and intrastate wars (at least 1.000 deaths), respectively. To control for possible agglomeration effects, we include urbanization, i.e. the number of people living in urban areas as a percentage of the total population, and (the log of) population density, i.e. the number of people per square km of land area (both from World Bank, 2016). Furthermore, we utilize measures of ethnic and religious fractionalization (Alesina et al., 2003) to capture links between population heterogeneity and political institutions / repression. To account for adverse effects of natural resource abundance highlighted in the resource curse literature (for an overview see (Frankel, 2010)), we employ (the log of) oil and gas production in 2014 US\$ per capita (Ross & Mahdavi, 2015). Since governments in only recently established political regimes may face special conditions, the durability of the current political regime as measured by the years since the last regime change (Marshall & Gurr, 2016) also enters as a control variable. At the individual level, we control for the age of the political leader (Goemans et al., 2009).

Our final sample constitutes an unbalanced panel including annual data on 458 leaders of 101 countries in the period from 1950 to 2010. The specific observations included in our analyses vary according to the considered dependent variable and the definition of non-democratic political regimes. For our baseline definition, we follow Marshall and Elzinga-Marshall (2017) and consider all countries with a Polity score ≤ 5 (on the original scale) as non-democratic. Accordingly, our baseline sample includes only data on leaders of countries with a Polity score ≤ 5 within the tenure of the respective leader. The robustness of our results against different thresholds is assessed in Sect. 6.1. Leaders of democratic political regimes are also considered separately as a robustness check in Sect. 6.4.

Our econometric strategy relies on a linear model shown by (14). Here D denotes the dependent variable (democracy / repression), e are the population’s average years of schooling, and y is the logarithm of GDP per capita. Control variables and their regression coefficients are represented by x and γ , respectively. Following the majority of empirical studies on democracy and state repression, we include a lag of the dependent variable with autoregressive coefficient ρ to account for the persistence of political institutions and human rights practices. Furthermore, it is likely that changes in our explanatory variables are reflected in changes in democracy and repression only with a time lag. For this reason, (14) links the current level of democracy / repression to the one-period lags of the explanatory variables. While ε_{lit} represents the idiosyncratic error term, leader and time fixed effects are denoted by η_l and δ_t , respectively. Note that η_l also captures country fixed effects as leaders are nested within countries.

$$D_{lit} = \rho \cdot D_{li,t-1} + \beta_1 e_{li,t-1} + \beta_2 y_{li,t-1} + x'_{li,t-1} \gamma + \eta_l + \delta_t + \varepsilon_{lit}, \quad (14)$$

Due to normalization of the dependent variables, β_1 represents the expected change in the indicator of democracy / repression as a percentage of its theoretical range

that is induced by a 1-year increase in the average years of schooling. Similarly, $\beta_2/100$ approximates the expected percentage change in the dependent variable (relative to its theoretical range) associated with a 1%-increase in per capita income. β_1 and β_2 represent the short-term effects of education and income, whereas long-term effects can be derived by additional calculations. In general, the cumulated change in the dependent variable over K periods due to persistent changes in education and income in period $t = 0$ is

$$\Delta D_{liK} = \sum_{k=1}^K \rho^{k-1} (\beta_1 de_{li0} + \beta_2 dy_{li0}). \quad (15)$$

In the following, (15) serves as the basis for our estimations of long-term effects. A problem arising when applying fixed effects estimators to dynamic panel data models like (14), particularly in large N - small T settings, is the so called “Nickell bias” (Nickell, 1981). This bias stems from correlation between the lagged dependent variable and the error term. One estimator that overcomes this problem is the difference GMM estimator, which estimates (14) in first differences and uses higher order lags as instruments for the differenced variables (Arellano & Bond, 1991). However, the difference GMM estimator potentially suffers from small sample bias, particularly in the presence of a highly persistent dependent variable (Alonso-Borrego & Arellano, 1999). In settings with large ρ , e.g. in case of highly persistent political institutions, difference GMM additionally faces the problem that lagged levels are weak instruments for subsequent changes. An alternative estimator with the potential to avoid these shortcomings is the system GMM estimator (Arellano & Bover, 1995; Blundell & Bond, 1998). System GMM imposes additional orthogonality conditions which can result in large asymptotic efficiency gains. Hence, this estimator is frequently applied in empirical studies on democracy and economic development (see, e.g., Castelló-Climent, 2008; Heid et al., 2012)). As a drawback, system GMM generates numerous internal instruments, which may overfit the instrumented variables. To avoid this problem, we restrict the number of lags used as instruments to roughly 1/3 of the number of available lags and additionally collapse the instrument matrix as described by Roodman (2009). As specification tests, we apply the Hansen J -test for validity of instruments and the Difference-in-Hansen test for validity of the additional moment conditions, respectively. In both cases, low p-values indicate potential validity problems. We also test for autocorrelation of the error term of order 1 and 2. While first-order autocorrelation is expected due to differencing of the estimating equation, we should not reject the null hypothesis of no second-order autocorrelation for our estimation to be valid.

While our theoretical model examines effects of education and income on democracy and repression, some authors posit that causality runs in the opposite direction (see, e.g., Acemoglu et al., 2019)). This would result in endogeneity, i.e. correlation between our main explanatory variables and the error term and lead to biased estimates of the regression coefficients. To account for this issue, we use instruments for education and income. Since we are not aware of any valid external instruments for $e_{li,t-1}$ and $y_{li,t-1}$ in our empirical context, we use lags of these variables as additional

instruments. While such “internal” instruments are often used in practical applications of GMM estimators, it should be noted that their validity relies on specific assumptions (Roodman, 2009) that may be violated in our setting. In particular, lags of endogenous explanatory variables may not fulfill the exclusion restriction due to dynamic relationships with relevant but unobserved covariates and, thus, may not qualify as valid instrumental variables. Against that background, our empirical results should be interpreted with some caution.

In all estimations, we cluster standard errors at the country level and thus allow for heteroscedasticity and autocorrelation of the errors of all leader-years within a country.

5 Results

Table 1 shows the regression results for non-democratic political regimes defined by a Polity score ≤ 5 . Model (1) gives the estimates of the baseline specification with democracy as the dependent variable. The coefficient of Education is positive and significant at the 1%-level and thus indicates a positive association between Democracy and the population’s average years of schooling. Also in line with theory, the negative coefficient of log GDP per capita implicates that an increase in per capita income is related to a lower level of democracy in the following period. These results remain robust against the inclusion of additional control variables in model (2). Although the coefficients of Education and log GDP per capita become smaller in magnitude, they show the expected sign and remain statistically significant. According to our long-term effect estimates, an additional year of schooling increases a country’s democracy score by approximately 28% (47%) of its theoretical range over 5 (10) years. An increase of per capita GDP by 1% is estimated to result in a relative reduction of the democracy score by roughly 0,6% (1%) over 5 (10) years. The large difference between short-term and long-term effects stems from the high persistence of political institutions that is reflected by coefficients of the lagged democracy score of roughly 0.9. In sum, the estimation results of model (1) and (2) support the hypotheses H_d^e and H_d^y .

Model (3) shows the results of the baseline specification with Repression as the dependent variable. The coefficient of Education is positive and significant, implicating that an increase in the population’s educational attainment is related to an increase in repression. This finding is in line with hypothesis H_r^e . The estimated effect of log GDP per capita on repression is insignificant. This is consistent with our theoretical model, which highlights opposing effects of income on repression leaving the net effect ambiguous. The inclusion of further control variables in model (4) does not change these results qualitatively. While the association between repression and the population’s average years of schooling remains positive, we do not find a statistically significant effect of income. Due to the lower persistence of repression compared to democracy, the estimated long-term effects of education on repression do not deviate heavily from the short-term effects. According to model (4), an

additional year of schooling increases the repression indicator by approximately 7.5% of its theoretical range over 5 to 10 years.

With regard to the control variables, we find weak evidence for a positive impact of urbanization on democracy, which is line with the theory of Lipset (1959). Consistent with core results in the literature on state repression, a larger population and intrastate conflict are found to be associated with higher levels of human rights violations (see, e.g., (Davenport, 2007; Hill & Jones, 2014)). In addition, model (4) reveals a positive relationship between regime durability and repression. According to the model diagnostics, we find evidence for first-order but not for second-order autocorrelation of the error terms. Furthermore, the null hypotheses of the Hansen *J*-test and the Difference-in-Hansen test are not rejected at conventional significance levels. Thus, these tests do not cast doubt on the validity of the specifications shown in Table 1.

In summary, the regression results presented in this section support the implications of our theoretical model. In non-democratic regimes, a higher level of education is found to increase democracy and repression, whereas higher income levels are related to lower democracy levels.

6 Robustness

6.1 Variation of the democracy threshold

The results derived above rely on a sample of non-democratic countries defined by a Polity score ≤ 5 . However, results should not depend qualitatively on the exact threshold used to define a non-democratic political regime. For robustness, we estimate model (2) and model (4) for threshold Polity scores between 3 and 7, representing a low and a high democracy threshold, respectively. The results obtained with Democracy as the dependent variable are shown in Table 2. Across all threshold values, we find positive effects of Education and negative effects of log GDP per capita. The estimated short-run and the long-run effect are of comparable magnitude across all models. Similarly, the results shown in Table 3 indicate that our findings regarding Repression are robust against variations of the threshold Polity score. While the estimation results of models (10) to (14) suggest that an increase in the population's educational attainment increases repression, there is no evidence for a systematic impact of log GDP per capita. Figure 1 illustrates the estimated short-run effects of Education and log GDP per capita on Democracy and Repression with 95% confidence intervals derived from Tables 2 and 3. Obviously, there is no substantial variation in effect sizes across the different threshold Polity scores.

6.2 Alternative democracy and repression indicators

To assess the robustness of our results regarding the use of alternative indicators of democracy, we use the X-Polity scores (Vreeland, 2008). In the context of studies focusing on the relationship between political regimes and civil war, Vreeland points

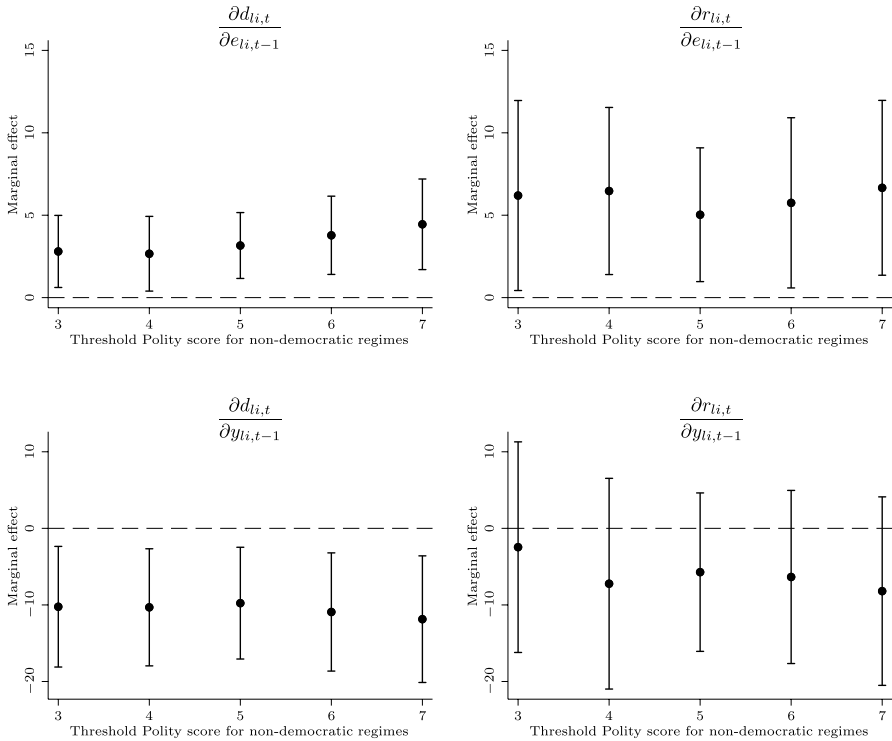


Fig. 1 Marginal effects of education and income on democracy and repression by threshold Polity score

Table 2 System GMM estimates of (15) with democracy as dependent variable using different threshold polity scores for the definition of a non-democratic regime

Model	(5)	(6)	(7)	(8)	(9)
Dependent variable	Democracy _{it}				
Threshold polity score	polity ≤ 3	Polity ≤ 4	Polity ≤ 5	Polity ≤ 6	Polity ≤ 7
Education _{it-1}	2.80** (1.12)	2.66** (1.16)	3.16*** (1.02)	3.78*** (1.21)	4.45*** (1.40)
log(GDP/capita _{it-1})	- 10.23** (4.02)	- 10.31*** (3.90)	- 9.77*** (3.72)	- 10.92*** (3.94)	- 11.86*** (4.22)
<i>Long-run effects</i>					
Education: 5 years	13.13**	12.49**	12.08***	15.19***	18.68***
log(GDP/capita) : 5 years	- 47.96**	- 48.40**	- 37.33***	- 43.88***	- 49.80***
Education: 10 years	24.26**	23.12**	17.93***	23.68***	30.49***
log(GDP/capita) : 10 years	- 88.63*	- 89.59*	- 55.42**	- 68.42**	- 81.31**

Standard errors are clustered by country and shown in parentheses. Significance levels: *10%, **5%, ***1%. The full set of control variables is included but not shown in the table. Number of observations: Model (5): N = 2572; Model (6): N = 2670; Model (7): N = 2847; Model (8): N = 3122; Model (9): N = 3332

Table 3 System GMM estimates of (15) with Repression as dependent variable using different threshold Polity scores for the definition of a non-democratic regime

Model	(10)	(11)	(12)	(13)	(14)
Dependent variable	Repression _{lit}				
Threshold Polity score	Polity ≤ 3	Polity ≤ 4	Polity ≤ 5	Polity ≤ 6	Polity ≤ 7
Education _{lit-1}	6.19** (2.94)	6.47** (2.59)	5.03** (2.07)	5.75** (2.63)	6.66** (2.71)
log(GDP/capita _{lit-1})	- 2.46 (7.02)	- 7.23 (7.02)	- 5.72 (5.28)	- 6.35 (5.77)	- 8.20 (6.28)
<i>Long-run effects</i>					
Education: 5 years	9.06**	9.53**	7.50**	7.86**	8.92**
log(GDP/capita) : 5 years	- 3.59	- 10.65	- 8.53	- 8.68	- 10.97
Education: 10 years	9.09**	9.56**	7.53**	7.87**	8.93**
log(GDP/capita) : 10 years	- 3.60	- 10.68	- 8.57	- 8.69	- 11.00

Standard errors are clustered by country and shown in parentheses. Significance levels: *10%, **5%, ***1%. The full set of control variables is included but not shown in the table. Number of observations: Model (10): N = 1375; Model (11): N = 1401; Model (12): N = 1557; Model (13): N = 1791; Model (14): N = 1972

Table 4 System GMM estimates of (15) for alternative measures of democracy and repression

Model	(15)	(16)	(17)
Dependent variable	X-Polity	V-Dem PDI	Political Terror Scale
Education _{lit-1}	1.74** (0.88)	0.74** (0.31)	3.04* (1.82)
log(GDP/capita _{lit-1})	- 5.24 (4.29)	- 1.47 (1.18)	- 5.13 (3.66)

Standard errors are clustered by country and shown in parentheses. Significance levels: *10%, **5%, ***1%. The full set of control variables is included but not shown in the table. Number of observations: Model (15): N = 2627; Model (16): N = 2750; Model (17): N = 1670

out that there are conceptual overlaps between the Polity scores as an indicator of democracy and indicators of political violence. To mitigate this problem, Vreeland proposes the X-Polity scores, which exclude the most problematic components from the Polity index. Furthermore, we use the participatory democracy index (PDI) provided by the V-Dem project (Coppedge et al., 2021) as an alternative, continuous measure of democracy. As an alternative repression indicator, we employ the Political Terror Scale scores, which measure political repression on a scale ranging from 1 (lowest level of repression) to 5 (highest level of repression) (Gibney et al., 2016).

The estimation results are shown in Table 4. We find positive and statistically significant coefficients of Education in all estimated models. These results support the

Table 5 System GMM estimates of (15) including interactions between education and log(GDP/capita) with indicator for military regimes

Model	(18)	(19)
Dependent variable	Democracy _{lit}	Repression _{lit}
Education _{lit-1}	4.25*** (1.45)	3.74** (1.83)
log(GDP/capita _{lit-1})	- 11.52** (5.02)	- 3.87 (5.43)
Military Regime _{lit-1}	- 28.98 (25.00)	38.94 (53.74)
Education _{lit-1} × Military Regime _{lit-1}	- 0.70 (1.47)	2.79 (3.03)
log(GDP/capita _{lit-1}) × Military Regime _{lit-1}	2.12 (3.63)	- 5.94 (8.49)

Standard errors are clustered by country and shown in parentheses. Significance levels: *10%, **5%, ***1%. The full set of control variables is included but not shown in the table. Number of observations: Model (18): N = 2764; Model (19): N = 1525

hypotheses H_d^e and H_r^e . Although not statistically significant, the estimated coefficients of logged GDP/capita in the models using the X-Polity scores and the V-Dem PDI as dependent variables are negative, which is qualitatively in line with hypothesis H_d^y .

6.3 Military dictatorships vs. other types of non-democratic regimes

The recent literature indicates relevant differences between military dictatorships and other types of non-democratic regimes (Bjørnskov, 2020; Bennett et al., 2021). We therefore explored potential effect modifications by including interaction terms between a binary variable indicating military dictatorships (Bjørnskov & Rode, 2020) and Income and Education, respectively. As show in Table 5, the estimated coefficients of the interaction terms are not statistically significant. Hence, we do not find evidence for different effects of economic development on democracy and repression in military dictatorships and other types of non-democratic regimes.

6.4 Regressions for democratic regimes

Our theoretical model considers the behavior of a non-democratic leader, who utilizes repression and political institutions. Due to a system of checks and balances, leaders under democratic political regimes are expected to have limited capability to use these instruments in general and repression in particular to secure office. Hence,

Table 6 System GMM estimates of (15) for democratic political regimes (Polity score ≥ 8)

Model	(20)	(21)
Dependent variable	Democracy _{it}	Repression _{it}
Education _{it,t-1}	- 1.79 (1.66)	0.99 (2.34)
log(GDP/capita _{it,t-1})	- 6.84 (5.84)	- 7.87 (6.87)

Standard errors are clustered by country and shown in parentheses. Significance levels: *10%, **5%, ***1%. The full set of control variables is included but not shown in the table. Number of observations: Model (15): N = 1864; Model (16): N = 1347

we should not find evidence for the hypotheses derived in Sect. 3 when estimating (14) based on a sample of democratic leaders. Table 6 shows the results for democratic political regimes defined by a Polity score ≥ 8 .⁵ In fact, we do not find evidence for effects of Education or log GDP per capita on repression. Similarly, the insignificant effect of log GDP per capita in model (15) does not point to adverse effects of income on democracy under democratic political leaders. There is also no evidence that higher (lower) levels of education increase (decrease) democracy under highly democratic political regimes.

7 Conclusion

This paper has presented some new evidence on the relation between repression, democratic institutions, and economic development in non-democracies. First, it has combined the common notion of repression as one tool of non-democratic leaders with insights on the strategic use of democratic institutions highlighted in previous studies (Gandhi & Przeworski, 2006, 2007). Drawing on a simple model, the paper has outlined a rationale for the complementary use of both instruments. Second, based on arguments relating education to democratic preferences (see, e.g., (Chong & Gradstein, 2015)), diverging effects of education and income on the popular political support for non-democratic governments have been highlighted. As a result, the paper has offered theoretical and empirical evidence that non-democratic governments respond differently to economic development, depending on whether it appears in the form of increasing education or per capita income. While higher education levels are found to be related to more democracy and more repression, there increases in per capita income go along with less concessions in terms of democratic institutions.

We are far from denying that this simple model has a number of caveats. As it stands, the model considers the level of democracy and the tax rate as independent choice variables of the leader. This implies that democratic institutions do not impinge on the leader's freedom to choose taxes, which is surely contestable. Even

⁵ To account for adverse regime changes, model (15) also includes observations where Polity_{it} < 8 if Polity_{it,t-1} ≥ 8 .

more importantly, we treat education and income as unrelated variables which are exogenous to the political leader. Definitely, autocratic governments can use public education strategically for indoctrination in their favor (Lott, 1999). Although our empirical results do not subscribe to the effectiveness of that strategy, it would surely be worthwhile to consider how education levels are affected by government action. This is in particular true because education enhances productivity and income.⁶ However, reverse feedback effects of income levels on education demand—which are absent in our approach - would have to be taken into account, too. In addition to education, the economic performance of a country is certainly affected by its democratic institutions and repression. The extent to which political freedom feeds economic freedom and hence income, as in Acemoglu and Robinson (2005), e.g., is not depicted in our analysis. We also do not consider how taxation affects aggregate economic activity. Finally, the only threat faced by the dictator in our model stems from dissatisfaction of the general population. A valuable extension of the model could focus on threats from within the political elite (Bennett et al., 2021; Bove & Rivera, 2015; Bjørnskov, 2020). All the interrelations outlined here have clear intertemporal dimensions. Hence, a fully fledged analysis would require a dynamic setup in which the leader anticipates how her current decisions affect future variables and choice sets. Just like democracy, repression and tax levels, income and education would be rather results of than constraints on political decision making. It is surely intriguing to delve into the even more fundamental factors driving non-democratic leaders' choices from a theoretical perspective. However, these factors defy empirical analysis. Hence, we take a much more modest approach here. The endogeneity of income and education challenges our findings without annihilating them. While surely tentative, our analysis adds to the doubt on the democracy-enhancing effect of economic development suggested by the modernization hypothesis—well in line with Congleton (2004), among others.

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Data availability Data are available upon request.

Code availability Code is available upon request.

Declarations

Conflict of interest The authors declare that they have no conflicts of interest.

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⁶ See Testa (2018) on how propaganda can affect the trade-off between economic and political effects of educational investment in non-democratic regimes.

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