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## **Democracy, Distance from the Technological Frontier, and Economic Growth: Some Empirical Results**

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## 1. Introduction

The aim of this paper is to empirically explore whether relations between democracy and economic growth vary with the distance from the technological frontier, and to provide explanations of the mechanisms and outcomes of that change.

There is extensive literature on the relationship between democracy and economic growth. A comprehensive analytical framework for considerations of causality has been set (Przeworski *et al.*, 2000), channels of influence have been theoretically identified (Przeworski and Limongi, 1993 and Tavares and Wacziarg, 2001), and the causality from democracy to economic growth has been empirically tested, though with somewhat different results (Barro, 1996, Rivera-Batiz, 2002, Oliva and Rivera-Batiz, 2002, Mobarak, 2005, Rodrik and Wacziarg, 2005, Persson and Tabellini, 2006, Papaioannu and Siourounis, 2008, Knutsen, 2013, Acemoglu *et al.*, 2015, Murin and Wacziarg, 2014, Madsen *et al.*, 2015, and Gruendler and Krieger, 2016). Nonetheless, most of the contributions do not address the issue of whether and to what extent the relation between democracy and growth changes with the distance from the technological frontier, i.e. with achieving a specific level of economic development (level of income per capita). There are no insights regarding whether, for example, democracy, which is favourable for economic growth of rich countries, is also inevitably favourable for growth in poor and medium income countries.

The way forward to answering this question could provide insight (Acemoglu, 2008) that democracy-growth causal relations can produce both outcomes. On the one hand, democracy can accelerate economic growth, mainly by removing barriers to entry, enabling new entries and thus increasing competition and competitive pressure, leading to more innovations and technological progress as the engine of growth. On the other hand, due to the preferences of the median voter for redistribution, democracy can produce more compulsory income redistribution and consequently higher tax burden, reducing investment returns, undermining incentives for both investment and innovation, slowing down economic growth. The crucial challenge is to identify the conditions in which one of the two mechanisms dominate the other, producing overall favourable or adverse effects of democracy on economic growth. If these conditions are identified, predictions can be made and appropriate policies could be designed.

These insights fit very well with the rather new approach to the causality from democracy to economic growth, including the concept of the distance to the technological frontier, which has been introduced. It has been suggested (Acemoglu *et al.*, 2006) that democratic political institutions enhance growth more in technologically advanced sectors, i.e. those sectors closed to the technological frontier, compared to the sectors that are far from the frontier. Combining these approaches provides an analytical framework that (Aghion *et al.*, 2008) differentiates the effects of democracy on growth, depending on the distance from the technological frontier. From available theoretical insights one could infer that democracy is not beneficial/relevant and may even be detrimental to economic growth at lower levels of economic development (with most of the firms/industries far from the technological frontier) and is beneficial for growth in countries with a higher level of economic development (close to the technological frontier).

The specified aim of this paper affects its structure. Relevant literature will be briefly reviewed in the following section of the paper. The main hypotheses that are to be tested will be formulated in the third section. The data that is used will be described and the strategy of

econometric research will be disclosed in the fourth section. The results of the empirical research and testing of the econometric robustness of these results follows. The discussion of the results and the conclusion conclude the paper.

## 2. Literature review

The early contribution to the debate (Barro, 1996) focuses on the relation between democracy, considered as political freedom, and economic freedom (rule of law, free markets, and small government consumption), which is recognised as favourable for economic growth. The empirical analysis provided some evidence that democracy can produce adverse effects on economic growth, mainly due to political pressure for compulsory distribution. Although the contribution did not focus on the different effects of democracy on growth for different income per capita levels (rather considering different effects on growth, i.e. income levels on democracy) it demonstrated that at the different levels of political freedom the increase of these freedoms can have contradictory effects on the economic growth, described by an inverted U curve.

Acemoglu (2008) provided an appropriate framework for evaluating economic effects of distinctive political institutions, analysing the trade-off between oligarchy and democracy, focusing on two policy distortions: taxation and entry barriers. Oligarchy protects private property rights of the business elite, hence taxation is moderate, and compulsory redistribution of income from producers (entrepreneurs, i.e. business elite) to the poor is limited.<sup>1</sup> Nonetheless, oligarchy creates substantial legal barriers to entry, which favour incumbents, enabling them to create rents and redistribute income in favour of the business elite.<sup>2</sup> Contrary to that, democracy undermines the protection of private property rights with distortive taxation (due to the preferences for redistribution of the median voter) and facilitates substantial redistribution of income from producers to the poor.<sup>3</sup> Nonetheless, democracy does not create legal barriers to entry, as they are not in favour of median voter, but only of the incumbent business elite.<sup>4</sup> Accordingly, the crucial question is whether protection of private property rights (in essence incentives to invest) is more important for

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<sup>1</sup> As suggested by Sonin (2003) protection of the private property rights in oligarchy need not to be universal, as the business elite has incentive to undermine the property rights of the poor.

<sup>2</sup> Acemoglu (2008) suggests that barriers to entry redistribute income towards the producers by reducing labour demand and wages. In addition to that, barriers to entry increase the producers' surplus (economic rent) and decreases consumer surplus, creating redistribution of welfare favouring the producers. Irrespectively of demand for labour and nominal wages, as it decreases real term wages, i.e. their purchasing power. Furthermore, as demonstrated by Rodrik (1999), wages in oligarchy/autocracy are lower than in democracies due to the lack of political freedom and free operation of trade unions, which consequently lowers the bargaining power of employees relative to the employers.

<sup>3</sup> Alesina and Rodrik (1994) and Persson and Tabellini (1994) provided theoretical insights and empirical evidence on the effects of the increase in inequality and the increase in compulsory income redistribution by excessive taxation. Within the theoretical framework set by Djankov *et al.* (2003), such taxation can be classified as state expropriation of private property rights and that expropriation is considered "social costs of dictatorship". It should be pointed out that their framework considers "dictatorship" as the opposite to "disorder". Accordingly, dictatorship is not a character of political institutions, but rather the level of government intervention, whatever the political character of the government may be. Accordingly, dictatorship of this kind (massive government intervention) can exist on both oligarchy and democracy. One way or the other, this kind of expropriation (distortive taxation) is not based on the violation of the law, but on its character, i.e. the content of the rules.

<sup>4</sup> Although Olson (1993) has some second thoughts about the ability of democracy to prevent special narrow interest groups from their activities and influence on decision makers and on the policy outcomes.

the economic growth of a country than removal of barriers to entry and enhancing competitive pressure (in essence incentives to innovate).

The other cornerstone of the analysis is the contribution of Acemoglu *et al.* (2006) with insight that economic growth is not based on a single, but several engines of growth. On lower or middle levels of per capita income, i.e. when the country is far from the technological frontier, growth is predominantly based on the production factor accumulation (with investments in both physical and human capital) and technology transfer (imitation or adaptation of technology from other countries), while at higher levels of per capita income, i.e. when the country is close to the technological frontier, growth is predominantly based on innovation, as technology transfer is not feasible/reasonable anymore and production factor accumulation experiences decreasing returns. Accordingly, Aghion and Grifith (2005) suggested that the different engines of growth do not require the same institutions for them to be effective.

The crucial link between the two frameworks is competition. It has been empirically demonstrated (Djankov *et al.*, 2002) that democracy creates smaller barriers to entry, fostering competition and competitive pressure from the new entries. The mechanism of this causality has been explained by Acemoglu (2008) with no incentives for the democratic government, which is accountable to the broad political bases (constituency), to create and/or maintain barriers to entry that will benefit only incumbent producers, i.e. the business elite, and create income redistribution from the constituency to the elite. Furthermore, it is evident that competitive pressure and new entries are a necessary condition for innovation in two ways: the first is by providing incentives for incumbent firms to increase efficiency and innovation, especially in the case of significant managerial slack (Grossman and Hart, 1983); the second is by allowing new entries whose profitability depends on innovation. Based on these premises it is reasonable to assume that democracy is beneficial for innovation and that democracy is favourable for economic growth if it is predominantly based on innovation.

This consideration has been further developed by Aghion *et al.* (2008) in a formal model which demonstrates that increasing the level of democracy, since it decreases barriers to entry, increases incentives for innovations of the firms that are close to the technological frontier and decreases these incentives for the firms that are far from the frontier. The empirical analysis that followed (manufacturing sectors for 180 countries over a period of 40 years) provided some evidence to support the main hypothesis that in democracy the benefits in investing in new technology are greater to those of bribing policy makers to raise the barriers to entry.

The other relevant question is whether competition can be harmful to economic growth if it is predominantly based on production factors accumulation. Aghion and Grifith (2005) claim that accumulation and imitation can prosper under limited competition, although they stop short of claiming that competition is not beneficial for the factor accumulation as a growth engine. Nonetheless, since competition levels out economic rent, it decreases expected returns as a crucial incentive for investment which undermines economic growth based on production factors accumulation. Accordingly, possible countervailing effects of competition on growth have been identified, as it provides incentives for the increase of TFP (in terms of both innovation and increased efficiency) and undermines incentives for capital accumulation.

Nonetheless, as demonstrated by Acemoglu (2008), the greater danger to economic growth comes from distortive taxation, i.e. expropriation of returns, which undermines incentives for

factor accumulation.<sup>5</sup> Accordingly, a general framework for consideration of relations between democracy and economic growth can be established. If a country is at a lower level of development/income, i.e. if its economy is far from the technological frontier, and its growth is hence based on capital accumulation, democracy is not helpful and even turns out to be detrimental to economic growth. If a country is on the higher level of development/income, i.e. if its economy is close to the technological frontier, and its growth is hence predominantly based on innovation, democracy is beneficial to economic growth.

### **3. Democracy and growth: the mechanisms of influence**

Following Acemoglu *et al.* (2005), it is assumed that political institutions affect economic institutions and it is economic institutions that affect economic growth. In this way, the mechanism by which democracy affects economic growth is indirect, via specific economic institutions.

Accordingly, it is considered in this paper that democracy influences economic growth via its impact on the four main groups of economic institutions.

- (a) A higher level of democracy produces a higher tax burden, decreases investment returns and the pace of their accumulation, and hence slows down economic growth, especially growth predominantly based on production factors accumulation.

This is due to the preference of the median voter for redistribution from rich to poor, which is taken into account in democracy and not in autocracy, where decision-makers are accountable only to the political and business elites, not to the constituency. The political preferences of the elites are against the redistribution from rich to poor.

- (b) A higher level of democracy produces greater rule of law, i.e. universal protection from the illegitimate expropriation of returns, increases returns on investment and the pace of their accumulation, and hence speeds-up economic growth, especially growth predominantly based on the production factors accumulation.

This is due to the insight that decision-makers in democracy, being accountable to the entire constituency, not to elite, have strong incentives to establish rule of law and in that way universal protection of private property rights. Contrary to that, the elites, both political and business, take care only of their own property rights and are looking for opportunities to violate the property rights of others, hence universal protection of property rights is not in their interest. Accordingly, the decision-makers in autocracy, accountable only to the elite, do not have an incentive to establish rule of law.<sup>6</sup>

- (c) A higher level of democracy produces more freedom to trade internationally, increases international competition and competitive pressure, creating incentives

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<sup>5</sup> This insight is consistent with the findings of the exercise of unbundling of institutions (Acemoglu and Johnson, 2005) that property rights institutions (those which protect economic agents against expropriation by the government and private predators) have stronger favourable effects to economic growth than contracting institutions (those that protect contractual rights). It is violation of the property rights that is the main mechanism by which democracy endangers economic growth.

<sup>6</sup> Clague *et al.* (1996) provided empirical support for the insight that it is not only the level of democracy, but also its maturity that is relevant for the protection of property and contractual rights.

for efficiency and innovation, and hence speeds-up economic growth, especially the one predominantly based on innovation.

Freedom to trade internationally undermines rents of the business elite and increases the welfare of all consumers, i.e. the entire constituency. Accordingly, there are no incentives for decision-makers in autocracy, accountable only to the elite, to liberalise foreign trade, and every incentive for decision-makers in democracy, accountable to the entire constituency, to establish freedom to trade internationally, following the median voter's preference for foreign trade.<sup>7</sup>

- (d) A higher level of democracy produces more economic freedom domestically, i.e. it creates a lower entry barrier, increases competition and competitive pressure, by creating incentives for efficiency and innovations, and hence speeds-up economic growth, especially growth predominantly based on innovation.

Similar to the freedom of international trade, freedom from regulated domestic markets, i.e. lower barriers to entry undermine rents of the business elite and increase the welfare of all consumers, i.e. the entire constituency. Accordingly, there are no incentives for decision-makers in autocracy, accountable only to the elites, to increase economic freedom domestically and every incentive for decision-maker in democracies to abolish domestic barriers to entry, following the median voters' preference for domestic business regulation.<sup>8</sup>

Apart from the influence of democracy on economic growth via economic institutions, i.e. its indirect influence, a direct impact of democracy should not be ruled out. The mechanism of this impact could be the political stability created by the democracy, which is beneficial for investments and their expected returns. Accordingly, it is assumed that:

- (e) Political stability produced by the uninterrupted duration of democracy strengthens incentives for both investment and innovation as it minimises the risk of changing economic institutions, possible expropriation of investments and their returns, and decreases regulatory risk to the entrepreneurs.

The main mechanism has been explored extensively (Alesina *et al.*, 1996, Carmignani, 2003, Sutter, 2003, Darby *et al.* 2004, Yang, 2008, and Lavigne, 2011) but the crucial insight is that democracy itself does not necessarily provide political stability, but rather only a mature democracy does (Clague *et al.*, 1996 and Persson and Tabellini, 1994 and 2009), hence the duration of uninterrupted democracy should be the indicator of political stability.<sup>9</sup>

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<sup>7</sup> The insights from the Stolper-Samuelson theorem are that owners of the scarce (less abundant) production factor are against foreign trade liberalisation are not taken into account in this analysis. If capital is the less abundant factor in autocracy, than the Stolper-Samuelson effect augments autocracy's preferences against foreign trade liberalisation, as the owner of capital (business elite) are against such a change of policy.

<sup>8</sup> Haan and Sturm (2003), Fidrmuc (2003), Giavazzi and Tabellini (2005) and Lundstroem (2005) provided empirical evidence in support of this hypothesis.

<sup>9</sup> An alternative explanation of the direct effects of democracy can be based on governance. It has been suggested (Rivera-Batiz, 2002) that an increase in democracy improves governance by constraining the action of corrupt public servants and, in that way, increases TFP.

#### 4. Main hypotheses

Taking into account the analytical framework of the paper and the considerations of the causality mechanisms, the main hypotheses that are empirically tested are:

1. Democracy is not beneficial for growth if a country is far from the technology frontier (low and medium income per capita), since an increase in democracy decreases rate of growth due to the increased distortive taxation, which undermines incentives for production factor accumulation.
2. Democracy is not beneficial for growth if a country is far from the technology frontier (low and medium income per capita), since an increase in democracy decreases the growth rate due to stronger competition and lower barriers to entry, which diminish returns and therefore undermines incentives for production factor accumulation.
3. Democracy is beneficial for growth if the country is far from the technology frontier (low and medium income per capita), since an increase in democracy increases the growth rate due to the rule of law and universal protection of property rights against private sector predators, which strengthens incentives for production factor accumulation.
4. Democracy is beneficial for growth if the country is close to the technology frontier (high income per capita), since an increase in democracy leads to an increase in the growth rate due to stronger competition and lower barriers to entry promoting competition efficiency and innovation, and increasing TFP.
5. Uninterrupted duration of democracy is beneficial for the growth irrespective of whether the country is close or far from the technological frontier.

Testing these hypotheses will shed some light on the insight that democracy is favourable for growth in cases of high income per capita, and not favourable, or even harmful, for growth at a lower and medium level of income.

#### 6. Data and methodology

##### *a. Data*

We used panel data for 214 countries, for the period from 1960 to 2013. Data on GDP per capita (variable GDP p.c. was taken from the World Bank World Development Indicators (WDI indicator NY.GDP.PCAP.KD) was used to control for convergence, as well as for measuring distance from the technological frontier (following Madsen *et al.*, 2015). Data on GDP per worker, which is used as an alternative indicator for convergence control and an alternative measure for distance from the technological frontier, are based on the data on labour force (WDI indicator NE.GDI.FTOT.ZS for labour force participation rate).

We used WDI data for gross fixed capital formation, % of GDP (WDI indicator NE.GDI.FTOT.ZS), as a measure of the investments in physical capital (variable INV). The level of human capital

(variable LSEC) was measured by the ratio of gross enrolment ratio to secondary schools for both sexes (WDI indicator SE.SEC.ENRR).

Three measures of democracy were used. The first measure used was Polity IV (Marshall *et al.*, 2006), with the democracy score ranging from -10 (least democratic) to 10 (most democratic). Secondly, we used the Freedom House democracy index (FH), classifying countries as free (1), partially free (2) and non-free (3), with the democracy score ranging from 7 (least democratic) to 1 (most democratic). The third democracy index (variable ANRR) is a democracy index constructed by Acemoglu *et al.* (2015), which provides us with a consolidated democracy index that originally uses both Polity IV and FH measures of democracy but then aims at refining the shortcomings of the previous indices by consolidating them with several secondary sources (Cheibub, Gandhi, and Vreeland (2010), Boix, Miller, and Rosato (2012), and Papaioannou and Siourounis's (2008)). The second and third measures were used only for testing the robustness of econometric results of the regressions models using Polity IV.

The duration of democracy is measured for each of the three indices (Polity IV, FH and ANRR), again with the Polity IV-based indicator of duration being the main one, and the other two used for robustness of the results, by using the WDI-based sample (1960-2013) and correcting the first year of democracy by applying Boix, Miller and Rosato (2012) to align the results with actual data on the emergence of democracy.

Economic institutions were measured by the Frazer Institute EFW index, covering 157 countries between 1970 and 2013. We used four out of five measures of the character of economic institutions through the degree of economic freedom they provide (variables: [F1] Size of Government; [F2] Legal System and Security of Property Rights; [F3] Freedom to Trade Internationally; [F4] Regulation), leaving out the variable (3) from the original Fraser EFW data (area: Access to Sound Money). The reason for such a choice is that access to sound money is a proxy which the Frazer EFW index labelled "freedom from inflation", which is not relevant for the character of economic institutions as it is the consequence of country's monetary policy.

#### *b. General econometric strategy*

We start with the linear regression model of the following form:

$$Y_{i,t} = \alpha_0 + \alpha_1 Dem_{i,t-5} + \beta_1 GDP_{i,t-5} + \beta_2 SEC_{i,t-5} + \beta_3 INV_{i,t-5} + CD_i + TD_t + \varepsilon_{i,t} \quad (1)$$

The set of explanatory variables is defined as follows: *Dem* is the measure of democracy in country *i* at time *t*, *GDP* is the log value of GDP per capita in country *i* at time *t*, *SEC* is a level of human capital in country *i* at time *t* approximated by secondary educational attainment (log value), *INV* is the log value of investment as % of GDP in country *i* at time *t*. *CD* and *TD* denote vectors of country and time dummies respectively. The stochastic error term is given as  $\varepsilon_{i,t}$ . Dependent variable  $Y_{i,t}$  is defined as:  $Y_{i,t} = 100 \left( \frac{GDP_{i,t} - GDP_{i,t-5}}{GDP_{i,t-5}} \right) / 5$ , thus representing the annual average five-year GDP per capita growth rate. Explanatory variables enter the equation with a lag of five periods. Such a lag enables results to be more robust to short-run variations in the data. Additionally, the absence of contemporaneous explanatory variables reduces the

issue of endogeneity. Both regression models, with and without investment as explanatory variable, are considered.

The baseline regression is first estimated as the panel two-way fixed effects model. The results of the Hausman test support its application against the panel random effects model. Standard errors for the parameters are calculated by using cross-section weights to take care of cross-section dependence in the data. The next method is based on the quantile regression approach, which allows for different parameters across different quantiles of the dependent variable (annual average five-year GDP per capita growth rate). It should be assumed that the given set of explanatory variables will not influence GDP per capita growth rate identically in its different quantiles. Therefore, to make our analysis more flexible, we conducted quantile estimation according to the methods proposed by Koeneker and Basset (1978). Standard errors for the parameters were derived by bootstrap simulation, with 2000 replications.

Further empirical analyses were performed on the following modification of equation (1):

- a) An interactive explanatory variable was added, representing the product of democracy and level of GDP, both at lag five ( $Dem_{i,t-5}GDP_{i,t-5}$ ).
- b) A new set of explanatory variables was introduced to capture the effects of the economic institutions. The economic institutions indicators are: Size of Government ( $F1_{i,t}$ ), Rule of Law, Legal System and Property Rights ( $F2_{i,t}$ ), Freedom to Trade Internationally ( $F3_{i,t}$ ), and Regulation ( $F4_{i,t}$ ). All of them are included in the regression models, lagging five periods.
- c) Instead of using the five-year annual average GDP per capita growth rate as a dependent variable, each of the indicators of economic institutions ( $F1_{i,t}$ ,  $F2_{i,t}$ ,  $F3_{i,t}$ ,  $F4_{i,t}$ ), is included as a dependent variable.
- d) The two-stage procedure estimation was conducted as follows. In the first step each of the indicators ( $F1_{i,t}$ ,  $F2_{i,t}$ ,  $F3_{i,t}$ ,  $F4_{i,t}$ ) was estimated as a function of democracy index, lagged five periods. Within the second step, the baseline regression (1) was estimated without the democracy index variable, but with the inclusion of each economic institution indicator along with the residual from the corresponding equation obtained in the first step.
- e) Instead of democracy as the explanatory variable with the Polity IV indicator, the duration of uninterrupted democracy was used.

The estimation results may be invalid if some of the variables are unit-root processes. Several unit-root tests were implemented in order to verify the order of integration of quantitatively defined variables. The first generations test defined by Levin *et al.* (2002, LLC), Im *et al.* (2003, IPS) and Maddala and Wu (1999, Fisher type ADF) were employed. These tests are designed for different specifications of the deterministic component. Only constant term may be included in the testing equation, or both constant and trend terms may be present. Since the results may vary depending on this specification, both versions are calculated and reported in Table 1.

All tests clearly indicate that the considered variables are stationary, except for the GDP per capita data. The results are not unique for GDP per capita data. The LLC test points to stationarity in both versions, while IPS and Fisher-type ADF tests, with constant and trend,

suggest the same conclusion (IPS test at the 10% significance level). However, versions without trend imply unit-root presence in GDP per capita. We may argue that this data exhibits a deterministic trend, which makes the model with constant and trend more adequate (cf. Jaunky, 2013). In summary, our finding is that the unit-root presence is not an econometric issue relevant in the model.

**Table1.**  
**Panel unit-root tests**

Variable	Deterministic terms	LLC	IPS	Fisher ADF
GDP	Constant	-5.15***	5.25	434.54
	Constant and trend	-3.39***	-1.30*	530.77***
INV	Constant	-5.66***	-8.89***	705.13***
	Constant and trend	-7.71***	-8.83***	684.55***
SEC	Constant	-23.01***	-4.72***	577.85***
	Constant and trend	-10.44***	-1.72**	489.98***
Y	Constant	-8.96***	-15.15***	977.08***
	Constant and trend	-4.57***	-10.09***	798.72***

Note: \*\*\*, \*\* and \* denote a significance of 1%, 5% and 10%, respectively.

Under the null hypothesis there exists a unit-root, while the alternative hypothesis presumes stationarity. LLC and IPS tests have asymptotically normal distributions. The Fisher ADF test is computed using an asymptotic chi-square distribution. The number of lag lengths is chosen according to the SC criterion, starting with the maximum value 3 in all series, except for SEC data where 4 lags are used. This number is based on the approximation  $(4(T/100))^{2/9} = 3.33$  (Basher and Westerlund, 2008).

Although endogeneity of the explanatory variable (democracy) should be fully controlled with the use of five years lagged value of the variable, Granger causality F-test was used. The results of the test with null hypothesis that democracy (Polity IV) does not Granger-cause annual average five-year GDP per capita growth rate (Table 2), demonstrated that there is no significant reversed causality.

**Table 2.**  
**Granger-causality F-testing from VAR model of Democracy (Polity IV) and annual average of five-year GDP per capita growth rate**

Model	Number of lags		
	5	7	9
Pooled	1.91 (0.09)	1.41 (0.20)	1.24 (0.26)
Two-way fixed effects	1.14 (0.34)	1.59 (0.13)	1.96 (0.04)

Note: p-values are given in parentheses

## 7. Empirical results

The research strategy was based on testing the hypothesis using regression models on the whole sample and then to estimate the same regression model on quantiles of the dependent variable (five-year average annual per capita growth rate). The specific values of the growth rates in quantiles are disclosed in the Annex (Table A1).

### 7.1. Basic model

The estimation of the starting regression model (1) provided the following results:

**Table 3.**

**Dependent variable: five-year average annual growth rate, 1975-2013**

Variable	(1)	(2)	(3)	(4)
Constant	51.113*** (4.359)	50.206*** (5.308)	47.489*** (3.720)	48.467*** (5.166)
Polity IV(-5)	0.016 (0.012)	0.129*** (0.023)	0.019 (0.012)	0.113*** (0.025)
GDP per capita (-5)	-6.227*** (0.546)		-5.613*** (0.500)	
GDP per worker (-5)		-5.733*** (0.372)		-5.823*** (0.366)
Secondary education (-5)	-0.322 (0.233)	1.903** (0.937)	-0.300 (0.200)	1.786** (0.903)
Investment to GDP (-5)	0.574** (0.229)	-1.127** (0.439)		
Countries (observations)	139 (3214)	124 (1485)	140 (3409)	126 (1496)
R-squared	0.468 0.436	0.567 0.516	0.461 0.431	0.564 0.514

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$

Theoretically speaking, level of democracy can influence the investment level, so the regressions were estimated both with and without investment level as an explanatory variable. The indicator of democracy proved statistically significant only in the specification with GDP per worker as the control for convergence, in such a way that improvement in democracy speeds-up economic growth. The significance level does not change with inclusion/removal of investment as explanatory variable.

Aiming at disaggregating the sample according to the distance from the technological frontier, the regressions have also been estimated at the quantile levels of the dependent variable with the following results (Table A2), with the democracy level parameter being statistically significant in all specifications up to the first 5<sup>th</sup> quantiles.

Taking into account convergence hypotheses and statistically significant negative sign of estimation of the GDP per capita as the explanatory variable, as well as the GDP per worker,

it is reasonable to assume that lower growth rates are predominantly allocated to countries with higher GDP per capita, i.e. countries closer to the technological frontier. Accordingly, the estimates of the regression parameters for the lower quantiles are the results for countries closer to the technological frontier. Most of the estimates of democracy indicators are statistically significant in the first six quantiles, i.e. for countries with lower growth rates and higher income per capita, and virtually none are significant when the remaining quantiles are included. This provides some evidence to support the finding that democracy speeds-up economic growth at a higher level of income, i.e. in cases of countries that are close to the technological frontier, but that there are no statistically significant relations when countries with lower levels of income per capita are included. The statistical significance of the positive impact of democracy on economic growth fades away when countries that are far from the technological frontier are included.

These results provide some empirical support for hypotheses (3) and (4), that democracy is beneficial to growth in countries that are close to the technological frontier. It is evident that the countervailing effects of democracy at a higher level of development undermines the negative effect of democracy in countries that are far from the technological frontier, providing some indirect empirical support the hypothesis (1) and (2).

In addition to that, for more insights related to this finding, estimations of the investment level as the explanatory variable of economic growth were carried out on the quantile level (Table A2). According to these results, investments are a statistically significant factor of economic growth at all levels of development, save the highest, i.e. with lowest growth rate. This is consistent with the view that economic growth of the countries close to the technology frontier is based on innovation rather than production factor accumulation. Nonetheless, inclusion of the second quantile only contributes to investments being a statistically significant factor of economic growth, i.e. a significant explanatory variable.

The explanation about investments being a significant factor of economic growth an all levels of income per capita, save the highest one, even at levels that indicate that the country is very close to the frontier, is consistent with the theory. It would be expected that the growth of countries that are close to the technological frontier is based on innovation and Schumpeterian creative destruction, but it seems that innovation and creative destruction are possible only if they are based on net investment. That is quite consistent with the insight that most of the innovation is done by new entries (Acemoglu, 2008). The alternative explanation is that if the growth is very slow, actually negative growth in the first quantile, improvement of the growth rate can also be achieved through reallocation of resources or through aggregate demand management, if that was the cause of the negative growth.

## *7.2. Interactive term model*

The findings of the initial regression models are supplemented by regressions that include an interactive term of democracy indicators and level of GDP per capita.

**Table 4.****Dependent variable: annual average five-year growth rate, 1975-2013**

Variable	(1)	(2)	(3)	(4)
Constant	47.481*** (3.794)	48.326*** (5.100)	47.528*** (3.706)	49.023*** (5.191)
Polity IV (-5)	0.023 (0.075)	0.137 (0.144)		
Polity IV (-5) Interactive	-0.0007 (0.010)	-0.003 (0.017)	0.002 (0.002)	0.014*** (0.003)
GDP per capita (-5)	-5.610*** (0.482)		-5.627*** (0.447)	
GDP per worker (-5)		-5.824*** (0.407)		-5.977*** (0.372)
Secondary education (-5)	-0.299 (0.208)	1.764 (0.942)	-0.282 (0.198)	1.891** (0.895)
Countries (observations)	140 (3409)	126 (1496)	140 (3409)	126 (1496)
R-squared	0.461	0.564	0.461	0.564
Adj. R-squared	0.430	0.513	0.430	0.513

\* Significant at  $p \leq 10\%$ \*\* Significant at  $p \leq 5\%$ \*\*\* Significant at  $p \leq 1\%$ 

The interactive term proved to be statistically significant and with theoretically expected sign in only one case. All regressions were estimated at quantile levels (Table A4.) and it provided evidence of statistical significant estimation of interactive term (only if the democracy indicator is removed from the regression) at the higher level of development, though only in one specification (with GDP per worker as a control variable), and several statistically significant estimates with a negative sign have been recorded with the other specification with adding the 8<sup>th</sup> and 9<sup>th</sup> quantile.

These results did not provide substantial empirical support for the finding that democracy, this time in interaction with the level of development, is beneficial for economic growth when a country is close to the technological frontier and has a detrimental effect when a country is far from the technological frontier.

### 7.3. Economic institutions model

The hypothesis that democracy “works” through economic institutions is tested in a set of regressions in which each of these institutions (F1, F2, F3, F4) is regressed at the level of democracy and the level of the GDP per capita (both lagged by five years) with various regression specifications. There are strong arguments in favour of positive correlation between GDP per capita and the size of the government (i.e. public consumption or tax burden), and between GDP per capita and rule of law, as more funds are available for funding the provision of rule of law as public good. There are some theoretical arguments in favour of

the insight of positive correlation between GDP per capita and freedom to trade both internationally and domestically, hence GDP per capita is included in the regression model to control that covariance.

The results demonstrated that most of the regressions provided statistically significant relations between democracy and all the considered economic institutions. In the simple regression model the democracy indicator is lagged five years, and GDP per capita or GDP per worker are used as a control variable.<sup>10</sup>

**Table 5.**  
**Dependent variable: Economic institutions F1 and F2, 1975-2013**

Variable	F1 (1)	F2(1)	F1 (2)	F2(2)
Constant	1.162* (0.649)	0.063 (0.552)	-2.016 (2.232)	5.247*** (1.330)
Polity IV (-5)	0.056*** (0.007)	0.014*** (0.005)	0.054*** (0.012)	0.037*** (0.009)
GDP per capita (-5)	0.606*** (0.081)	0.660*** (0.068)		
GDP per worker (-5)			0.854*** (0.244)	0.060*** (0.145)
Countries (observations)	129 (1937)	129 (1913)	119 (1088)	120 (1102)
R-squared	0.794	0.854	0.840	0.918
Adj. R-squared	0.779	0.844	0.820	0.908

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$

All of the estimations being statistically significant with positive sign provides evidence that the increase of democracy increases both the size of the government and rule of law. The conjecture that GDP per capita is positively correlated with both the size of the government and rule of law has been confirmed.

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<sup>10</sup> The theoretical argument for such a control variable in the case of the size of the government is based on the Wagner law and in the case of the evident link between the cost of operation of rule of law institutions/organisation and funding capacity.

**Table 6.****Dependent variable: Economic institutions F3 and F4, 1975-2013**

Variable	F3 (1)	F4(1)	F3 (2)	F4(2)
Constant	-3.494*** (0.728)	-2.501*** (0.450)	5.712*** (1.769)	-0.922 (1.548)
Polity IV (-5)	0.129*** (0.008)	0.064*** (0.005)	0.143*** (0.019)	0.006*** (0.009)
GDP per capita (-5)	1.187*** (0.091)	1.068*** (0.056)		
GDP per worker (-5)			0.077 (0.191)	0.780*** (0.168)
Countries (observations)	129 (1933)	129 (1922)	119 (1096)	119 (1103)
R-squared	0.760	0.826	0.816	0.844
Adj. R-squared	0.743	0.814	0.794	0.825

\* Significant at  $p \leq 10\%$ \*\* Significant at  $p \leq 5\%$ \*\*\* Significant at  $p \leq 1\%$ 

The results provide evidence that democracy increases economic freedom, both as freedom to trade internationally and freedom from regulation of domestic markets. Now that the causality link between democracy and economic institutions has been established, the question of how to test the mechanism of influence of democracy to economic growth, i.e. whether it is direct or indirect (via economic institutions), has been answered in two ways.

The first one is estimation of two specifications of the regression model, with and without economic institutions, both with GDP per capita (alternatively GDP per worker), and the level of human capital as the control variable. Investments in physical capital are omitted because it is assumed that investments are crucial for growth and that their level is influenced by economic institutions and indirectly by democracy.

**Table 7.****Dependent variable: annual average five-year growth rate, 1975-2013**

Variable	(1)	(2)	(3)	(4)
Constant	47.489*** (3.470)	45.383*** (4.055)	48.467*** (5.166)	44.276*** (5.445)
F1 (-5)		0.110* (0.066)		0.019 (0.089)
F2 (-5)		0.199*** (0.076)		-0.001 (0.111)
F3 (-5)		0.429*** (0.066)		0.436*** (0.088)
F4 (-5)		0.146 (0.102)		0.052 (0.121)
Polity IV (-5)	0.018 (0.012)	0.010 (0.020)	0.113*** (0.022)	0.075** (0.031)
GDP per capita (-5)	-5.613*** (0.450)	-6.271*** (0.462)		
GDP per worker (-5)			-5.823*** (0.366)	-5.432*** (0.516)
Secondary education (-5)	-0.296 (0.200)	0.871** (0.408)	1.786** (0.903)	1.135** (0.573)
Countries (observations)	140 (3409)	115 (1066)	126 (1496)	105 (746)
R-squared	0.461	0.656	0.564	0.698
Adj. R-squared	0.431	0.606	0.514	0.638

\* Significant at  $p \leq 10\%$ \*\* Significant at  $p \leq 5\%$ \*\*\* Significant at  $p \leq 1\%$ 

When economic institutions are included, together with democracy indicators, in the regression model as explanatory variables some of them are statistically significant, but the democracy indicator does not change the significance, demonstrating that it is difficult to conclude that most of the impact of democracy on economic growth is driven via selected economic institutions in the way that has been suggested by Acemoglu *et al.* (2005).

Analysis at the quantile level (Table A5) demonstrates that most of the estimates of the F1 parameters (size of the government) are not statistically significant, but the F2 parameters (rule of law) are significant up to the 6<sup>th</sup> quantile. Nonetheless, the parameters of the F3 indicators (freedom to trade) are statistically significant, demonstrating that relations between that freedom and economic growth are robust to the change at the level of development. The results of F4 (regulation of domestic market) are paradoxical since for most of the quantiles there is a negative sign of the statistically significant estimate. These results suggest that freedom to trade internationally is not harmful to growth at the lower level of development, i.e. growth in countries that are far from the technological frontier, but the freedom from domestic markets regulation may be.

The explanation of the obtained results could be that economic freedom fosters competition and competition provides incentives for economic efficiency, leading to the selection of investment projects that are more efficient, contributing to growth by increasing TFP. Furthermore, competition pressure provides incentives for all undertakings to be efficient (both in terms of allocative and productive efficiency), and the level of inefficiency in the countries far from the technological frontier is estimated to be high enough that sustainable growth of TFP can be expected.

#### *7.4. Two-stage model*

The other way to estimate the impact of democracy on economic growth via economic institutions is based on the two-stage procedure. In the first stage the economic institutions indicators F1-F4 were estimated using the democracy index lagged five years, as an explanatory variable. The second stage uses the estimate of each economic institution indicator (F1-R1P, F2-R2P, F3-R3P, F4-R4P) as an explanatory variable, together with the residual of the first stage estimation (R1P, R2P, R3P R4P) in the growth rate regression model, as a dependent variable, and GDP per capita and level of human capital as standard control variables. Accordingly, F#-R#P is basically a component of economic institutions that can be explained by democracy, and the R#P is part of the economic institutions that cannot be explained by democracy, but of some other origin.

**Table 8.****Two-stage procedure, based on Polity IV and GDP per capita control**

Dependent variable: annual average five-year growth rate, 1975-2013

Variable	(1)	(2)	(3)	(4)	(5)
Constant	46.865*** (4.031)	43.349*** (4.921)	44.252*** (4.339)	49.086*** (4.346)	45.105*** (4.291)
F1(-5)-R1P(-5)	1.039*** (0.383)				
R1P(-5)	0.412*** (0.014)				0.050 (0.067)
F2(-5)-R2P(-5)		-0.534 (1.749)			
R2P(-5)		0.282*** (0.102)			0.134* (0.077)
F3(-5)-R3P(-5)			0.539*** (0.177)		
R3P(-5)			0.386*** (0.105)		0.356*** (0.066)
F4(-5)-R4P(-5)				0.969*** (0.350)	
R4P(-5)				0.363*** (0.098)	0.051 (0.107)
GDP per capita (-5)	-6.109*** (0.510)	-5.054*** (1.486)	-5.654*** (0.471)	-6.348*** (0.573)	-5.664*** (0.488)
Secondary education (-5)	-0.018 (0.369)	0.947** (0.494)	0.317 (0.468)	-0.123 (0.435)	1.077*** (0.392)
Countries (observations)	115 (1087)	117 (1095)	117 (1101)	117 (1133)	115 (1056)
R-squared	0.606 0.551	0.618 0.565	0.607 0.553	0.613 0.561	0.642 0.590

\* Significant at  $p \leq 10\%$ \*\* Significant at  $p \leq 5\%$ \*\*\* Significant at  $p \leq 1\%$

**Table 9.****Two-stage procedure, based on Polity IV and GDP per worker control**

Dependent variable: annual average five-year growth rate, 1975-2013

Variable	(1)	(2)	(3)	(4)	(5)
Constant	46.865*** (4.031)	43.349*** (4.921)	44.252*** (4.339)	49.086*** (4.346)	45.105*** (4.291)
F1(-5)-R1P(-5)	1.039*** (0.383)				
R1P(-5)	0.412*** (0.014)				0.050 (0.067)
F2(-5)-R2P(-5)		-0.534 (1.749)			
R2P(-5)		0.282*** (0.102)			0.134* (0.077)
F3(-5)-R3P(-5)			0.539*** (0.177)		
R3P(-5)			0.386*** (0.105)		0.356*** (0.066)
F4(-5)-R4P(-5)				0.969*** (0.350)	
R4P(-5)				0.363*** (0.098)	0.051 (0.107)
GDP per capita (-5)	-6.109*** (0.510)	-5.054*** (1.486)	-5.654*** (0.471)	-6.348*** (0.573)	-5.664*** (0.488)
Secondary education (-5)	-0.018 (0.369)	0.947** (0.494)	0.317 (0.468)	-0.123 (0.435)	1.077*** (0.392)
Countries (observations)	115 (1087)	117 (1095)	117 (1101)	117 (1133)	115 (1056)
R-squared	0.606 0.551	0.618 0.565	0.607 0.553	0.613 0.561	0.642 0.590

\* Significant at  $p \leq 10\%$ \*\* Significant at  $p \leq 5\%$ \*\*\* Significant at  $p \leq 1\%$ 

Based on these results, it is evident that it is economic institutions that influence economic growth – democracy only partially influences economic institutions, so there are institutional changes, which affect growth, that are not caused by democracy or the lack of it.

The hypothesis that democracy can be harmful for economic growth is based on the insight that an increase in economic freedom enhances competitions and in a way (Aghion and Griffith, 2005) that disables rents and, consequently undermines incentives for investment. Nonetheless, the empirical results do not support this hypothesis as parameters of F3 and F4, in the regression with level of investment as dependent variable, proved to be statistically significant and positive with all three specifications of lagging.

**Table 10.****Dependent variable: Investments as % of GDP, 1975-2013**

Variable	(1)	(2)	(3)
Constant	2.412*** (0.081)	2.721*** (0.081)	2.757*** (0.085)
F1(-1)	0.008 (0.010)		
F2(-1)	0.011 (0.007)		
F3(-1)	0.026*** (0.006)		
F4(-1)	0.050*** (0.009)		
F1(-3)		-0.005 (0.008)	
F2(-3)		0.003 (0.008)	
F3(-3)		0.022*** (0.007)	
F4(-3)		0.027*** (0.010)	
F1(-5)			-0.014* (0.008)
F2(-5)			-0.002 (0.009)
F3(-5)			0.031*** (0.007)
F4(-5)			0.028*** (0.011)
Countries (observations)	135 (1869)	131 (1601)	126 (1349)
R-squared	0.607	0.600	0.594
Adj. R-squared	0.571	0.559	0.545

\* Significant at  $p \leq 10\%$ \*\* Significant at  $p \leq 5\%$ \*\*\* Significant at  $p \leq 1\%$ 

It seems that competitive pressure creates incentives for investment, for incumbents to keep-up with new entries and other incumbents. Furthermore, innovations are substantially implemented by investment in new capacities and hardware.

### 7.5. Duration of democracy model

Finally, the important question is whether democracy influences economic growth directly, irrespectively of its influence on economic institutions. The hypothesis is that political stability is favourable for economic growth, as it is beneficial for business decisions to invest and

innovate, both of which speed up economic growth. However, the proxy for political stability is not the index of democracy, but the duration of uninterrupted democracy.

**Table 11.**

**Dependent variable: annual average five-year growth rate, 1975-2013**

Variable	(1)	(2)	(3)	(4)
Constant	31.677*** (2.122)	42.312*** (2.923)	33.529*** (2.724)	45.879*** (3.866)
F1 (-5)		0.093 (0.054)		-0.139 (0.054)
F2 (-5)		0.076 (0.070)		-0.201** (0.100)
F3 (-5)		0.558*** (0.062)		0.659*** (0.081)
F4 (-5)		0.137 (0.096)		-0.045 (0.112)
Duration Polity IV	0.076*** (0.007)	0.022*** (0.007)	0.018*** (0.007)	0.000 (0.008)
GDP per capita (-5)	-4.377*** (0.299)	-6.398*** (0.423)		
GDP per worker (-5)			-5.200*** (0.316)	-5.785*** (0.449)
Secondary education (-5)	0.994*** (0.146)	1.735*** (0.374)	3.910*** (0.610)	1.955*** (0.610)
Countries (observations)	203 (5158)	122 (1142)	170 (1951)	110 (789)
R-squared	0.348	0.584	0.485	0.631
Adj. R- squared	0.322	0.532	0.436	0.567

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$

It has been demonstrated that there are statically significant estimates of the duration of democracy in the growth equations. The significance remains when economic institutions are included in the specification, confirming that democracy speeds-up economic growth by providing political stability. In these models fixed-time effects were not taken into account because of the nature of the duration of democracy. When time-fixed effects are included the estimate of the parameter of duration of democracy becomes statistically insignificant.

The quantile regression was applied to these regression models (Table A6.). The results are that there are significant estimates of the democracy duration parameter with positive sign at lower quantiles, i.e. for countries close to the technology frontier. With inclusion of the countries with higher growth rates, countries that are far from the technology frontier, statistical significance decreases, only to reappear with the negative sign with the inclusion of countries with the highest growth rates, i.e. countries with the lowest income levels. This

provides some empirical evidence that democracy is good for growth for countries that are close to the technology frontier, but bad for growth in countries that are far from the technology frontier.

## **8. Robustness tests**

The main econometric robustness test was based on using alternative democracy indicators. The Freedom House indicator and the ANRR indicator, based on Acemoglu *et al.* (2015), have been used, in addition to Polity IV. Eventually, all these indicators were transformed into democracy duration indicators. The estimation results using the Freedom House democracy indicator provided even more statistically significant estimates than the base line regressions. The number of statistically significant estimates decreased somewhat, but not substantially.

The additional robustness test has been the change of lagging of the main explanatory variables. Instead of a five-year lag, which was used in the original specification of the regression model, a three-year lag was introduced. No significant changes in the obtained results occurred.

Finally, the sample was reduced to the countries that experienced duration of democracy for less than 15 and 30 years, assuming that in consolidated democracies there is a small variance of the democracy indicators over time. Again, no significant changes in the obtained results occurred.

## **9. Conclusion**

The results of the empirical analysis provided some evidence that democracy is not beneficial to economic growth at a lower level of development, i.e. in cases of countries that are far from the technological frontier, and that it can even be harmful. On the other hand, it provided evidence that democracy is beneficial to economic growth at a higher level of development, i.e. in cases of countries that are close to the technological frontier.

Statistically significant estimates of all three democracy indicators, both as self-standing or interactive terms with the GDP per capita, were recorded up to 6<sup>th</sup> quantile, but with inclusion of the countries with a higher growth rate, i.e. lower income, the significance decreased. These results provide no support for the hypothesis that democracy is beneficial for growth in the countries far from the technological frontier, but provide evidence that it is beneficial for countries that are close to it.

The empirical results provided ample evidence that democracy influences economic institutions in such a way that an increase in democracy produced an increase in the size of the government, an increased tax burden, boost in rule of law, and an increase in economic freedom – both freedom to trade internationally and freedom from regulation on the domestic markets. These results are robust regarding the indicator of democracy (with the exception of rule of law) and the lag of its effect on economic institutions.

The hypothesis that democracy is harmful for the growth in countries far from the technological frontier is based on two explanations. The first is that democracy increases the

size of the government. Empirical results provide some evidence that supports the insight that an increase in democracy results in an increase in the size of the government, nonetheless, no statistically significant negative impact of the size of the government on the growth rate has been recorded. Some of the estimates have even a positive sign, although statistical significance is not robust. Though positive impact of the rule of law on economic growth has been empirically supported, with robust statistically significant estimates, the statistical significance of the relation between democracy and rule of law, even though the signs are as expected, is not quite robust.

The second explanation is that democracy promotes economic freedoms due to the lower barrier to entry and stronger competition, and consequently undermines returns on investments and decreases incentives for accumulation of production factors, as the main growth engine in the case of countries that are far from the technological frontier.

Empirical results provided ample and unequivocal evidence that democracy promotes both freedom to trade internationally and freedom from regulation of the domestic markets. It was demonstrated that freedom to trade internationally is beneficial to economic growth at all levels of development, although results for freedom for regulation on the domestic market proved to be more complicated, with most of the estimates at the lower level of growth rate being statistically significant and negative, implying that an increase in these freedoms is not beneficial for growth for most of the quintiles.

Using two stage procedure it was demonstrated that there are statistically significant relations between economic institutions that are influenced by democracy and economic growth. The part of the variance of the economic institutions that can be explained by the variance of democracy in most of the cases can explain only a modest part of the variation of the growth rate.

The empirical results provide some evidence that democracy influences economic growth not only indirectly, through economic institutions, but also directly, providing political stability and predictability. Democracy duration was used for measuring that influence, based on all three indicators of democracy. This relationship proved to be statistically significant at higher level of development, with some paradoxical results with the inclusion of the quintiles at the lower level of development, i.e. higher growth rates; longer duration can be detrimental to economic growth.

Future research should focus on the decomposition of the index of freedom from the regulation on the domestic market, to obtain a better understanding of the relationship between democracy and these specific economic institutions, as well as their impact on economic growth.

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## Annex

**Table A1.**

**Interval range of the dependent variable (five years' average annual per capita growth rate)**

Interval determined by	Growth rate from	Growth rate to
the 10% quantile	-23.0	-1.69
the 10% quantile and the 20% quantile	-1.69	-0.12
the 20% quantile and the 30% quantile	-0.11	0.73
the 30% quantile and the 40% quantile	0.74	1.37
the 40% quantile and the 50% quantile	1.37	1.94
the 50% quantile and the 60% quantile	1.94	2.49
the 60% quantile and the 70% quantile	2.50	3.10
the 70% quantile and the 80% quantile	3.10	3.87
the 80% quantile and the 90% quantile	3.88	5.27
the 90% quantile and the 100% quantile	5.28	37.4

**Table A2.**

**Quantile results for a democracy indicator and growth**

Quantile	Polity IV (GDP per capita)	Polity IV (GDP per worker)
10% quantile	0.183*** (0.020)	0.119*** (0.417)
20% quantile	0.111*** (0.016)	0.677*** (0.021)
30% quantiles	0.076*** (0.011)	0.070*** (0.016)
40% quantile	0.051*** (0.008)	0.600*** (0.016)
50% quantile	0.031*** (0.009)	0.052*** (0.013)
60% quantile	0.016* (0.010)	0.039** (0.018)
70% quantile	0.003 (0.009)	0.275 (0.020)

80% quantile	-0.008 (0.013)	0.005 (0.027)
90% quantile	-0.002 (0.014)	-0.011 (0.039)

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$

**Table A3.**

**Quantile results for democracy indicator and investments**

Quantile	Polity IV INV(-5)
10% quantile	0.153 (0.342)
20% quantile	0.457** (0.211)
30% quantiles	0.574*** (0.222)
40% quantile	0.461** (0.251)
50% quantile	0.661*** (0.175)
60% quantile	0.667*** (0.236)
70% quantile	0.544*** (0.242)
80% quantile	0.638*** (0.285)
90% quantile	1.023*** (0.359)

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$

**Table A4.****Quantile results for interactive term with a democracy indicator**

Quantile	Interactive Polity IV GDP per capita	Interactive Polity IV GDP per worker
10% quantile	0.015 (0.011)	0.014*** (0.004)
20% quantile	0.003 (0.009)	0.007*** (0.002)
30% quantiles	-0.003 (0.006)	0.007*** (0.001)
40% quantile	-0.003 (0.004)	0.007*** (0.002)
50% quantile	-0.001 (0.005)	0.006*** (0.001)
60% quantile	-0.006 (0.006)	0.004** (0.002)
70% quantile	-0.009* (0.006)	0.003 (0.002)
80% quantile	-0.016** (0.007)	0.001 (0.003)
90% quantile	-0.036*** (0.011)	-0.001 (0.004)

\*Significant at  $p \leq 10\%$ \* Significant at  $p \leq 5\%$ \*\*\*Significant at  $p \leq 1\%$ **Table A5.****Quantile results for economic institutions F1-F4 with a democracy indicator**

Quantile	F1 (-5)	F2 (-5)	F3 (-5)	F4 (-5)	Polity IV
10% quantile	-0.039 (0.096)	0.186 (0.119)	0.577*** (0.145)	-0.129 (0.107)	0.046** (0.022)
20% quantile	-0.029 (0.073)	0.340*** (0.101)	0.355*** (0.101)	-0.228*** (0.086)	0.073*** (0.019)
30% quantiles	-0.011 (0.063)	0.272*** (0.098)	0.229*** (0.078)	-0.288*** (0.085)	0.061*** (0.020)
40% quantile	-0.039 (0.054)	0.275*** (0.074)	0.217*** (0.063)	-0.310*** (0.087)	0.035* (0.018)
50% quantile	-0.071 (0.055)	0.184*** (0.071)	0.303*** (0.064)	-0.292*** (0.091)	0.026 (0.019)

60% quantile	-0.118** (0.052)	0.125* (0.072)	0.299*** (0.070)	-0.195** (0.082)	0.021 (0.019)
70% quantile	-0.081 (0.058)	0.043 (0.089)	0.313*** (0.079)	-0.152* (0.088)	0.002 (0.022)
80% quantile	-0.122* (0.072)	0 (0.107)	0.288** (0.118)	-0.191* (0.113)	-0.004 (0.024)
90% quantile	-0.102 (0.085)	-0.145 (0.101)	0.327** (0.142)	-0.082 (0.136)	-0.011 (0.029)

Note: Three estimates of each F1 to F4 in each table square are those from the regressions with Polity IV, HF and ANRR respectively.

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$

**Table A6.**

**Quantile results for duration of democracy with three democracy indicators**

Quantile	Duration Polity IV with F1-F4	Duration Polity IV
10% quantile	0.005** (0.002)	0.007*** (0.002)
20% quantile	0.006*** (0.002)	0.004*** (0.001)
30% quantiles	0.005*** (0.002)	0.004*** (0.001)
40% quantile	0.004* (0.002)	0.002** (0.001)
50% quantile	0.002 (0.002)	0.002* (0.001)
60% quantile	0.000 (0.002)	0.000 (0.000)
70% quantile	-0.003 (0.003)	-0.000 (0.000)
80% quantile	-0.008*** (0.002)	-0.001 (0.001)
90% quantile	-0.010*** (0.003)	-0.002 (0.001)

\* Significant at  $p \leq 10\%$

\*\* Significant at  $p \leq 5\%$

\*\*\* Significant at  $p \leq 1\%$