

Boris Begović

School of Law, University of Belgrade and Center for Liberal-democratic Studies, Belgrade

Zorica Mladenović

School of Economics, University of Belgrade

Danica Popović

School of Economics, University of Belgrade and Center for Liberal-democratic Studies,
Belgrade

Democracy, distance from the technological frontier and economic growth: Some empirical results

CLDS Working Paper #0116, May 2016

The support of the Swiss National Science Foundation, program SCOPE IZ73Z0_152730, and cooperation with University of Zurich Department of Economics is gratefully acknowledged. This is preliminary draft, do not quote it without explicit permission of the authors.

1. Introduction

There is a vast literature on the relationship between democracy and economic growth. A comprehensive 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 and Madsen *et al.*, 2015). Nonetheless, most of the contributions do not take into account the income *per capita* level and do not address the issue whether and to what extent the relation between democracy and growth changes with the level of income *per capita*, i.e. with the achieved level of economic development. If, for example, democracy is favourable for economic growth of rich countries, is it also necessarily favourable for growth of 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 median voter for redistribution, democracy can produce more compulsory income redistribution and consequently higher tax burden, reducing investment returns, undermining incentives for both investments and innovation, slowing down economic growth. The crucial challenge is to identify conditions in which one of the two mechanisms dominate over the other, producing overall favourable or adverse effects of democracy to economic growth. If these conditions are identified, the predictions can be made and the appropriate policies could be designed.

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

The aim of this paper is to empirically explore whether relations between democracy and economic growth change with the distance to the technological frontier and to provide explanations of the mechanisms and outcomes of that change. A 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 third section. Data used will be described and 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 result follow. Discussion on the results and a conclusion end the paper.

2. Literature review

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

Acemoglu (2008) provided the 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 its business elite, hence taxation is moderate and compulsory redistribution of income from producers (entrepreneurs, i.e. business elite) to the poor is limited.¹ Nonetheless, oligarchy creates substantial legal barriers to entry that favour incumbents, enabling them to create rents and redistribute income in favour of business elite.² Contrary to that, democracy undermines the protection of private property rights with distortive taxation (due to the preferences for redistribution of median voter) and facilitates substantial redistribution of income from producers to the poor.³ 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.⁴ Accordingly, the crucial question is whether protection of private property rights (in essence incentives to invest) is more important for economic growth of a

¹ As suggested by Sonin (2003) protection of the private property rights in oligarchy needs not to be universal, as business elite has incentives to undermine property rights of the poor.

² 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 increases producers' surplus (economic rent) and decreases consumer surplus, creating redistribution of welfare in favour of producers irrespectively of demand for labour and nominal wages, as it decreases real term wages. Furthermore, as demonstrated by Rodrik (1999), wages in oligarchy/autocracy are lower than in democracies due to the lack of political freedom and free operations of trade unions and consequently lower bargaining power of employees relative to the employers.

³ Alesina and Rodrik (1994) and Persson and Tabellini (1994) provided theoretical insights and empirical evidence on the effects of increase in inequality and increase in compulsory income redistribution by excessive taxation. Within the theoretical framework set by Djankov *et al.* (2003), such a taxation can be classified as state expropriation of private property rights and that expropriation is considered as „social costs of dictatorship“. It should be pointed out that their framework consider „dictatorship“ as the opposite to „disorder“. Accordingly dictatorship is not a character of a political institutions, but rather the level of government intervention, whichever 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 expropriation (distortive taxation) is not based on the violation of the law, but on its character.

⁴ Though Olson (1993) has some second thoughts about ability of democracy to prevent narrow special interest groups from their operations and influence to the decision makers and the policy outcomes.

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

The other cornerstone of the analysis is contribution of Acemoglu *et al.* (2006) with insight that economic growth is not based on the single, but several engines of growth. On the lower or middle level of income *per capita*, i.e. when the country is far away from the technological frontier, growth is predominantly based on the factor accumulation (with investments in both physical and human capital) and technology transfer (imitation or adaptation of the technology from other countries), while on the higher level income *per capita*, i.e. when the country is close to the technological frontier, growth is predominantly based on the innovation, as technology transfer is not feasible/reasonable anymore and 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 barrier to entry, fostering competition and competitive pressure form the new entries. The mechanism of this causality has been explained by Acemoglu (2008) with no incentives for the democratic government, accountable to the broad political bases (constituency) to create and/or maintain barriers to entry than will benefit only incumbent producers, i.e. business elite and create income redistribution from the constituency to the elite. Furthermore, it is evident that competitive pressure and new entries are necessary condition for innovation in two ways. The first one is by providing incentives for incumbent firms for increasing efficiency and innovation, especially in the case of significant managerial slack (Grossman and Hart, 1983). The second one is by allowing new entries whose profitability depends on innovations. Based on these premises it reasonable to assume that democracy is beneficial for innovations and that democracy is favourable for economic growth if it is predominantly based on innovations.

This consideration has been further developed by Aghion *et al.* (2008) in a formal model which demonstrates that increasing level of democracy, as 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 away from the frontier. The empirical analysis that followed (manufacturing sectors for 180 counters in the period of 40 years) provided some evidence to support the main hypothesis that in democracy benefits in investing in new technology are bigger to those of bribing policy makers to raise the barriers to entry.

The other relevant question is whether competition can be harmful for economic growth if it is predominantly based on production factors accumulation. Aghion and Grifith (2005) claims 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 engine growth. Nonetheless, since competition levels out economic rents, 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 to growth have been identified, as it provides incentives for the increase of TFP (both in terms of innovation and increased efficiency) and undermines the incentives for capital accumulation.

Nonetheless, as demonstrated by Acemoglu (2008) the bigger danger to economic growth comes from distortive taxation, i.e. expropriation of returns, which undermines incentives for factor accumulation.⁵ Accordingly, a general framework for consideration of relations between democracy and economic growth can be established. If a country is on the lower level of development/income, i.e. if its economy is far away from technological frontier, hence its growth is 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, hence its growth is predominantly based on innovations, democracy is beneficial to economic growth.

3. Main hypotheses

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 mechanism by which democracy affects economic growth is indirect, via specific economic institutions

Accordingly, it is assumed that democracy influence economic growth via its impact on the four main groups of economic institutions.

1. Higher level of democracy produces higher tax burden, decreases investment returns, the pace of their accumulation, and hence slows down economic growth, especially one predominantly based on the production factors accumulation.

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

2. Higher level of democracy produces more rule of law, i.e. universal protection from the illegitimate expropriation of returns, increases returns to the investment, the pace of their accumulation, and hence speeds-up economic growth, especially one predominantly based on the production factors accumulation.

This is due to the decision-makers in democracy being accountable to the whole constituency, not to the elites only, as elites take care only of their own property rights and are looking for opportunity to violate property rights of the other, hence universal protection of property rights is not in their interest, so decision-makers in autocracy, accountable to the elite, do not have incentive to establish rule of law.⁶

⁵ 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.

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

3. Higher level of democracy produces more freedom to trade internationally, increases competition and competitive pressure, creating incentives for efficiency and innovations, and hence speeds-up economic growth, especially one predominantly based on innovations.

Freedom to trade internationally undermines rents of the business elite and increases the welfare of all consumers, i.e. whole 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-maker in democracy to establish freedom to trade internationally following median voter's preference on foreign trade.⁷

4. Higher level of democracy produces more economic freedom domestically, i.e. it creates less barrier to entry, increases competition and competitive pressure, creating incentives for efficiency and innovations, and hence speeds-up economic growth, especially one predominantly based on innovations.

Similar to the freedom of international trade, freedom from regulated domestic markets, i.e. less barriers to entry undermines rents of the business elite and increases the welfare of all consumers, i.e. whole 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 democracy to abolish domestic barrier to entry following median voter preference on domestic business regulation.⁸

Apart from the influence of democracy to economic growth via economic institutions, i.e. its indirect influence, a direct impact of democracy should not be ruled out. The mechanism of that impact could be political stability that is beneficial for investments and their returns. Accordingly the hypothesis is:

5. Political stability produced by uninterrupted duration of democracy strengthens incentives for both investment and innovation as it minimises the risk of changing economic institutions 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 political stability is not necessarily provided by democracy itself, but only by mature democracy (Clague *et al.*, 1996 and Persson and Tabellini, 1995 and 2009), hence duration of uninterrupted democracy should be the indicator of political stability.⁹

Taking into account the analytical framework of the paper the main hypotheses are:

⁷ Insights from Stolper-Samuelson theorem owners of the scarce less abundant factor are against foreign trade liberalisation are not taken into account in this analysis. If capital is less abundant factor in autocracy, than Stolper-Samuelson effect augments autocracy's preferences against foreign trade liberalisation,

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

⁹ Alternative explanation of direct effects of democracy can be based on the governance. It has been suggested (Rivera-Batiz, 2002) that increase in democracy improves governance by constraining the action of corrupted public servants and in that way increases TFP.

6. Democracy is not beneficial for growth if a country is far away from the technology frontier, (low and medium income *per capita*), since increase in democracy decreases rate of growth due to the increased distortive taxation that undermines incentives for production factor accumulation.
7. Democracy is not beneficial for growth if the country is far away from the technology frontier, (low and medium income *per capita*), since increase in democracy decreases rate of growth due to stronger competition and lower barriers to entry that diminish returns and in that way undermines incentives for production factor accumulation.
8. Democracy is beneficial for growth if the country is far away from the technology frontier (low and medium income *per capita*), since increase in democracy increases rate of growth due to the rule of law and universal protection of property rights against private sector predators, strengthening incentives for production factor accumulation.
9. Democracy is beneficial for growth if the country is close to the technology frontier (high income *per capita*), since increase in democracy produces increase in rate of growth due to stronger competition and lower barriers to entry promoting competition efficiency and innovation, increasing TFP.

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

4. Data and methodology

4.1. Data

We use panel data for 214 countries over the period from 1960 to 2013. Data on GDP per capita (variable GDP p.c. are taken from the World development indicators of the World Bank (WDI indicator NY.GDP.PCAP.KD) are used to control for convergence, as well as for measuring distance from the technological frontier (following Madsen *et al.*, 2015).

We use 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) is 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 democracy score ranges from -10 (least democratic) to 10 (most democratic outcome). Secondly, we use Freedom house democracy index (FH), classifying countries as free (1), partially free (2) and non-free (3), with democracy score ranges from 7 (least democratic) to 1 (most democratic outcome). The third democracy index (variable ANRR) is a democracy index constructed by Acemoglu *et al.* (2015), which provides us with a consolidated democracy index which originally uses both Polity IV and FH measures of democracy but then aims at refining 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).

Duration of democracy is measured for each of the three indices (Polity IV, FH and ANRR) using the WDI-based sample (1960-2013) and correcting the first year of democracy with Boix, Miller and Rosato (2012) in order to make results in line with actual data on emergence of democracy.

Economic institutions were measured by Frazer EFW index, covering 157 countries from 1970 to 2013. We used four out of five measures of the attained 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 Frazer EFW data (area: Access to Sound Money). The reason for such a choice is that access to sound money is a proxy for what Frazer EFW index labelled as “freedom from inflation” which is not relevant for the character of economic institutions as it is rather the consequence of country’s monetary policy.

4.2. General econometric strategy

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

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

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. Stochastic error term is given by $\varepsilon_{i,t}$. 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 annual average five-year GDP per capita growth rate. Explanatory variables enter the equation with lag of five periods. Such a lag enables results to be more robust to short-run variations in the data. In addition, absence of contemporaneous explanatory variables reduces the problem of endogeneity. Both models with and without investment variable are considered.

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

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

- a) New explanatory variable is added representing product of democracy and level of GDP both at lag five ($Dem_{i,t-5}GDP_{i,t-5}$).
- b) New set of explanatory variables is introduced to capture effects of economic institutions. These indicators are given as: Size of government ($F1_{i,t}$), Rule of law, Legal system and property rights ($F2_{i,t}$), Freedom to international trade ($F3_{i,t}$) and Regulation ($F4_{i,t}$). They enter equation lagged five periods.
- c) Instead of using annual average five-year GDP per capita growth rate as dependent variable, each of the indicators of economic institutions ($F1_{i,t}, F2_{i,t}, F3_{i,t}, F4_{i,t}$), is included as dependent variable.
- d) The two stage procedure is conducted as follows. In the first step each of the indicators ($F1_{i,t}, F2_{i,t}, F3_{i,t}, F4_{i,t}$) is estimated as a function of democracy index lagged five periods. Within the second step baseline regression (1) is estimated without democracy index variable, but with the inclusion of each economic institution indicator along with the residual from the corresponding equation found in the first step.

Estimation results may be invalid if some of the variables are unit-root processes. To verify the order of integration of quantitatively defined variables several unit-root tests are implemented. The first generations test defined by Levin et al. (2002, LLC), Im et al. (2003, IPS) and Maddala and Wu (1999, Fisher type ADF) are 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 term may be present. As results may vary depending on this specification both versions are calculated and reported in Table.

Except for GDP per capita data, all tests clearly indicate that variables considered are stationary. Results are not unique for GDP per capita data. 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 these data exhibit deterministic trend, which makes 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 modelling.

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 significance at the 1%, 5% and 10% significance level. Under the null hypothesis there exists a unit-root, while alternative hypothesis assumes stationarity. LLC and IPS tests have asymptotically normal distribution. Fisher ADF test is computed using an asymptotic chi-square distribution. The number of lag lengths is chosen according to SC

criterion starting with the maximum value 3 in all series, except in SEC data where 4 lags are used. This number is based on approximation $(4(T/100))^{2/9} = 3.33$ (Basher and Westerlund, 2008).

5. Empirical results

Research strategy is based on testing the hypothesis using regression models on the level of the whole sample and then to estimate the same regression model on the level of quantiles of the dependent variable (five years average annual per capita growth rate). Taking into account values of the GDP in the sample the quantiles are specified as:

Table 2.
Quantile range of the dependent variable (five years average annual per capita growth rate)

Quantile	Growth rate from	Growth rate to
1 st quantile	-23.0	-1.69
2 nd quantile - 1 st quantile	-1.69	-0.12
3 rd quantile – 2 nd quantile	-0.11	0.73
4 th quantile – 3 rd quantile	0.74	1.37
5 th quantile – 4 th quantile	1.37	1.94
6 th quantile – 5 th quantile	1.94	2.49
7 th quantile – 6 th quantile	2.50	3.10
8 th quantile – 7 th quantile	3.10	3.87
9 th quantile – 8 th quantile	3.88	5.27
10 th quantile – 9 th quantile	5.28	37.4

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

Table 3.
Dependent variable: five years average annual growth rate, 1975-2013

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	51.113*** (4.359)	54.270*** (4.248)	50.490*** (4.069)	47.489*** (3.720)	51.023*** (3.698)	47.567*** (3.470)
Polity IV	0.016 (0.012)			0.019 (0.012)		
FH		-0.172* (0.101)			-0.239** (0.099)	
ANRR			-0.167 (0.180)			-0.151 (0.164)
GDP per capita (-5)	-6.227*** (0.546)	-6.770*** (0.531)	-6.145*** (0.500)	-5.613*** (0.500)	-6.175*** (0.444)	-5.656*** (0.412)
Secondary education (-5)	-0.322 (0.233)	0.091 (4.359)	-0.260 (0.226)	-0.300 (0.200)	0.156 (0.197)	-0.141 (0.192)
Investment to GDP (-5)	0.574** (0.229)	0.600*** (0.231)	0.580*** (0.221)			
Countries (observations)	139 (3214)	158 (3438)	150 (3463)	140 (3409)	167 (3706)	159 (3751)

R squared	0.468 0.436	0.483 0.452	0.462 0.431	0.461 0.431	0.472 0.441	0.455 0.424
-----------	----------------	----------------	----------------	----------------	----------------	----------------

* 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 and explanatory variable. Only one indicator of democracy (FH) proved statistically significant in such a way that improvement in democracy speeds-up economic growth, though level of significance drops with inclusion of INV.¹⁰

The regressions have also been estimated on the quantile levels with the following results (Table 4.)

Table 4.
Quantile results for democracy indicators

Quantile	Polity IV	FH	ANRR	Polity IV with INV	FH with INV	ANRR with INV
First quantile	0.183*** (0.020)	-1.231*** (0.200)	1.188*** (0.349)	0.178*** (0.021)	-1.354*** (0.196)	1.440*** (0.403)
First 2 quantiles	0.111*** (0.016)	-0.614*** (0.097)	0.784*** (0.184)	0.119*** (0.015)	-0.659*** (0.105)	0.968*** (0.211)
First 3 quantiles	0.076*** (0.011)	-0.591*** (0.086)	0.492*** (0.173)	0.079*** (0.012)	-0.627*** (0.090)	0.777*** (0.187)
First 4 quantiles	0.051*** (0.008)	-0.451*** (0.075)	0.342*** (0.146)	0.054*** (0.010)	-0.449*** (0.084)	0.454** (0.149)
First 5 quantiles	0.031*** (0.009)	-0.325*** (0.081)	0.145 (0.144)	0.040*** (0.009)	-0.394*** (0.073)	0.246 (0.166)
First 6 quantiles	0.016* (0.010)	-0.221*** (0.088)	-0.141 (0.151)	0.023** (0.011)	-0.271*** (0.094)	0.004 (0.175)
First 7 quantiles	0.003 (0.009)	-0.107 (0.081)	-0.181 (0.134)	0.003 (0.009)	-0.164** (0.097)	-0.135 (0.142)
First 8 quantiles	-0.008 (0.013)	-0.010 (0.127)	-0.352** (0.171)	-0.012 (0.012)	-0.014 (0.125)	-0.381* (0.205)
First 9 quantiles	-0.002 (0.014)	0.061 (0.141)	-0.296 (0.233)	-0.016 (0.019)	0.149 (0.178)	-0.507 (0.309)

* Significant at $p \leq 10\%$

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

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

Taking into account convergence hypotheses and statistically significant negative estimation of the GDP *per capita* as explanatory variable, it is reasonable to assume that lower growth rates are allocated to the countries with higher GDP *per capita*, i.e. countries closer to the technological frontier. Accordingly, the estimates of the regression parameters for the lower

¹⁰ Negative sign of the parameter is due to the nature of FH democracy index, as 1 stands for fully democratic and 7 stands for fully autocratic country.

quantiles are results for the countries closer to the technological frontier. Most of the estimates of democracy indicators are statistically significant in the first six quantiles, i.e. for the countries with lower growth rate and higher income *per capita*, and virtually none is significant with including the remaining quantiles. That gives some evidence to support the finding that democracy speeds-up economic growth on the higher level of income, i.e. in the case of countries that are close to the technological frontier, but that there is no statistically significant relations when countries with lower levels of income per capita are included. The statistical significance of the positive impact of democracy to economic growth fades away when countries that are far away from the technological frontier are included.

These results provide some empirical support for the hypothesis (9), that democracy is beneficial to the growth in countries that are close to the technological frontier. It is evident that countervailing effects of democracy at the lower level of development undermines positive effect of the democracy in countries that are far away from the technological frontier, providing some empirical support the hypothesis (6), (7) and (8).

In addition to that, for more insights regarding this counterintuitive finding, estimations of the investment level as explanatory variable of economic growth should be done on the quantile level (Table 5.).

Table 5.
Quantile results for INV

	Polity IV INV(-5)	FH INV(-5)	ANNR INV(-5)
First quantile	0.153 (0.342)	-0.232 (0.330)	0.047 (0.368)
First 2 quantiles	0.457** (0.211)	0.066 (0.249)	0.426** (0.223)
First 3 quantiles	0.574*** (0.222)	0.435** (0.190)	0.594*** (0.174)
First 4 quantiles	0.461** (0.251)	0.438** (0.193)	0.629*** (0.173)
First 5 quantiles	0.661*** (0.175)	0.514** (0.147)	0.532*** (0.158)
First 6 quantiles	0.667*** (0.236)	0.495** (0.227)	0.651*** (0.186)
First 7 quantiles	0.544*** (0.242)	0.510** (0.238)	0.686*** (0.234)
First 8 quantiles	0.638*** (0.285)	0.555*** (0.256)	0.699*** (0.279)
First 9 quantiles	1.023*** (0.359)	1.028*** (0.325)	0.995*** (0.329)

* Significant at $p \leq 10\%$

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

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

Hence, investments are statistically significant factor of economic growth on all the levels of development, save the highest, i.e. with lowest growth rates. 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, only inclusion of the second quantile, contributes for investments to be statistically significant factor of economic growth, i.e. significant explanatory variable.

The explanation about investments being significant factor of economic growth on all levels of income *per capita* save only the highest one, even on the levels that indicates that country is very close to the frontier is consistent with the theory. It should be expected that growth of the 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 investments. 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 on the growth rate can be achieved also with reallocation of resources or though aggregate demand management, if that was the cause of the negative growth.

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

Table 6.

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

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	47.481*** (3.794)	52.884*** (2.980)	46.884*** (5.545)	47.528*** (3.706)	50.566*** (3.687)	47.495*** (5.095)
Polity IV	0.023 (0.075)					
FH		-1.215 (0.777)				
ANRR			0.844 (1.124)			
Polity IV Interactive	-0.0007 (0.010)			0.002 (0.002)		
FH Interactive		0.132 (0.104)			-0.027** (0.013)	
ANRR Interactive			-0.139 (0.153)			-0.025 (0.025)
GDP per capita (-5)	-5.610*** (0.482)	-6.379*** (0.358)	-5.534*** (0.690)	-5.627*** (0.447)	-6.134*** (0.440)	-5.639*** (0.611)
Secondary education (-5)	-0.299 (0.208)	0.083 (0.206)	-0.184 (0.228)	-0.282 (0.198)	0.172 (0.196)	-0.147 (0.229)
Countries (observations)	140 (3409)	167 (3706)	159 (3751)	140 (3409)	167 (3706)	159 (3751)
R squared	0.461	0.472	0.455	0.461	0.472	0.455
Adj. R squared	0.430	0.441	0.425	0.430	0.441	0.425

* Significant at $p \leq 10\%$

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

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

Only in one case interactive term proved to be statistically significant, though with theoretically expected sign. All regressions were estimated on quantile levels and it provided evidence for statistical significant estimation of interactive term (only if the democracy indicator is removed from the regression on the higher level of development, though a few statistically significant estimates with negative sign have been recorded with including 8th and 9th quantile.

Table 7.

Quantile results for interactive term with three democracy indicators

Quantile	Interactive Polity IV with Polity IV	Interactive FH with FH	Interactive ANRR with ANRR	Interactive Polity IV	Interactive FH	Interactive ANRR
First quantile	0.015 (0.011)	-0.059 (0.105)	-0.031 (0.252)	0.023*** (0.003)	-0.163*** (0.028)	0.157*** (0.052)
First 2 quantiles	0.003 (0.009)	-0.041 (0.059)	-0.109 (0.102)	0.014*** (0.002)	-0.078*** (0.013)	0.086*** (0.024)
First 3 quantiles	-0.003 (0.006)	-0.032 (0.046)	-0.090 (0.082)	0.009*** (0.001)	-0.070*** (0.010)	0.057*** (0.019)
First 4 quantiles	-0.003 (0.004)	0.005 (0.047)	-0.080 (0.095)	0.006*** (0.001)	-0.053*** (0.010)	0.041** (0.019)
First 5 quantiles	-0.001 (0.005)	-0.032 (0.047)	0.034 (0.097)	0.004* (0.001)	-0.039*** (0.010)	0.022 (0.017)
First 6 quantiles	-0.006 (0.006)	-0.015 (0.043)	-0.064 (0.111)	0.002 (0.001)	-0.026*** (0.010)	-0.020 (0.020)
First 7 quantiles	-0.009* (0.006)	0.000 (0.058)	-0.055 (0.094)	0.0002 (0.001)	-0.014 (0.010)	-0.023 (0.017)
First 8 quantiles	-0.016** (0.007)	0.080** (0.070)	-0.111 (0.109)	-0.002 (0.002)	-0.002 (0.015)	-0.050** (0.023)
First 9 quantiles	-0.036*** (0.011)	0.242*** (0.092)	-0.489** (0.241)	-0.002 (0.011)	0.013 (0.017)	-0.053* (0.033)

• *Significant at $p \leq 10\%$

• * Significant at $p \leq 5\%$

• ***Significant at $p \leq 1\%$

These results provide additional 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 detrimental effects when a country is far away from the technological frontier.

The hypothesis that democracy “works” through economic institutions is tested in a set of regressions in which each of the economic institutions (F1, F2, F3, F4) is regressed on the level of democracy and 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 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 the rule of law as public good. There are some theoretical arguments in favour of the insight of positive correlation both between GDP *per capita* and freedom to trade internationally and domestically, hence GDP *per capita* is included in the regression model to control that covariance.

The results demonstrated that in the most of the regressions provided statistically significant relations between democracy and all considered economic institutions. In the simple regression model democracy indicator is lagged for five years and income *per capita* is used as a control variable.¹¹

Table 8.

Dependent variable: Economic institutions F1 and F2, 1975-2013

Variable	F1 (1)	F1 (2)	F1(3)	F2(1)	F2(2)	F2(3)
Constant	1.162* (0.649)	-1.712** (0.820)	1.150* (0.630)	0.063 (0.552)	2.268*** (0.638)	-0.420 (0.545)
Polity IV (-5)	0.056*** (0.007)			0.014*** (0.005)		
FH (-5)		-0.193** (0.066)			-0.091** (0.046)	
ANRR (-5)			0.250* (0.101)			0.070 (0.072)
GDP per capita (-5)	0.606*** (0.081)	1.067*** (0.099)	0.645*** (0.080)	0.660*** (0.068)	0.412*** (0.077)	0.712*** (0.068)
Countries (observations)	129 (1937)	139 (1973)	132 (2048)	129 (1913)	138 (1978)	131 (1993)
R squared	0.794	0.934	0.922	0.854	0.875	0.855
Adj. R squared	0.779	0.929	0.917	0.844	0.865	0.845

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

Some of the statistically significant results provide some evidence that increase of democracy increases both size of the government and rule of law. Conjecture that GDP *per capita* is positively correlated with both size of the government and rule of law has been confirmed.

Table 9.

Dependent variable: Economic institutions F3 and F4, 1975-2013

Variable	F3 (1)	F3 (2)	F3(3)	F4(1)	F4(2)	F4(3)
Constant	-3.494*** (0.728)	-2.632*** (0.895)	-5.312*** (0.746)	-2.501*** (0.450)	-1.971*** (0.564)	-3.466*** (0.443)

¹¹ 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 costs of operations of rule of law institutions/organisation and funding capacity.

Polity IV (-5)	0.129*** (0.008)			0.064*** (0.005)		
FH (-5)		-0.256*** (0.071)			-0.330*** (0.047)	
ANRR (-5)			0.619*** (0.102)			0.485*** (0.064)
GDP per capita (-5)	1.187*** (0.091)	1.198*** (0.108)	1.405*** (0.094)	1.068*** (0.056)	1.111*** (0.068)	1.172*** (0.055)
Countries (observations)	129 (1933)	138 (1959)	131 (2026)	129 (1922)	138 (1996)	131 (2007)
R squared	0.760	0.733	0.703	0.826	0.811	0.809
Adj. R squared	0.743	0.712	0.682	0.814	0.797	0.796

- * 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, the causality link between democracy and economic institutions has been established, the question is how to test the mechanism of influence of democracy to economic growth, i.e. is it direct or indirect (via economic institutions), has been answered in two ways.

The first one is estimating two specification of the regression model, with and without economic institutions both with GDP per capita and level of human capital as a control variable. Investment in physical capital are omitted because it is assumed that investments are crucial for growth and their level is influenced by the economic institutions and indirectly by democracy. This assumption has been confirmed.

Table 10.

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

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	47.489*** (3.470)	45.383*** (4.055)	51.023*** (3.698)	43.720*** (4.613)	47.567*** (3.470)	43.045*** (4.619)
F1 (-5)		0.110* (0.066)		0.145** (0.065)		0.117* (0.066)
F2 (-5)		0.199*** (0.076)		0.147** (0.072)		0.130*** (0.073)
F3 (-5)		0.429*** (0.066)		0.357*** (0.064)		0.356*** (0.066)
F4 (-5)		0.146 (0.102)		0.165* (0.099)		0.176* (0.101)
Polity IV(-5)	0.018 (0.012)	0.010 (0.020)				
FH			-0.239**	-0.020		

			(0.099)	(0.183)		
ANRR					-0.151 (0.164)	-0.369 (0.296)
GDP per capita (-5)	-5.613*** (0.450)	-6.271*** (0.462)	-6.175*** (0.444)	-6.203*** (0.512)	-5.656*** (0.412)	-6.079*** (0.508)
Secondary education (-5)	-0.296 (0.200)	0.871** (0.408)	0.156 (0.197)	1.290*** (0.099)	-0.141 (0.192)	1.292*** (0.393)
Countries (observations)	140 (3409)	115 (1066)	167 (3706)	122 (1135)	159 (3751)	117 (1109)
R squared	0.461	0.656	0.472	0.642	0.455	0.634
Adj. R squared	0.431	0.606	0.441	0.591	0.424	0.582

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

When economic institutions are included in the regression model as explanatory variables together with democracy indicators, most of them are statistically significant, and democracy indicators become statistically insignificant, demonstrating that most of the impact of democracy to economic growth is driven via selected economic institutions in the way that has been suggested by Acemoglu *et al.* (2005).

Table 11.

Quantile results for economic institutions F1-F4 with three democracy indicators

Quantile	F1 (-5)	F2 (-5)	F3 (-5)	F4 (-5)	Polity IV	FH	ANRR
First quantile	-0.039 (0.096)	0.186 (0.119)	0.577*** (0.145)	-0.129 (0.107)	0.046** (0.022)	-0.176* (0.095)	0.259 (0.470)
	-0.044 (0.079)	0.183 (0.127)	0.572*** (0.092)	-0.105 (0.086)			
	-0.036 (0.079)	0.269** (0.134)	0.601*** (0.096)	-0.111 (0.110)			
First 2 quantiles	-0.029 (0.073)	0.340*** (0.101)	0.355*** (0.101)	-0.228*** (0.086)	0.073*** (0.019)	-0.144* (0.074)	0.319 (0.350)
	-0.056 (0.079)	0.291*** (0.110)	0.480*** (0.084)	-0.313*** (0.088)			
	-0.092 (0.086)	0.315*** (0.120)	0.488*** (0.086)	-0.275*** (0.090)			
First 3 quantiles	-0.011 (0.063)	0.272*** (0.098)	0.229*** (0.078)	-0.288*** (0.085)	0.061*** (0.020)	-0.071 (0.074)	0.344 (0.284)
	-0.040 (0.065)	0.191 (0.101)	0.337*** (0.080)	-0.348*** (0.096)			
	-0.006 (0.064)	0.252*** (0.098)	0.316*** (0.086)	-0.402*** (0.105)			

First 4 quantiles	-0.039 (0.054)	0.275*** (0.074)	0.217*** (0.063)	-0.310*** (0.087)	0.035* (0.018)	-0.054 (0.074)	0.252 (0.239)
	-0.031 (0.055)	0.268*** (0.070)	0.298*** (0.065)	-0.384*** (0.085)			
	-0.033 (0.057)	0.269*** (0.074)	0.309*** (0.069)	-0.406*** (0.093)			
First 5 quantiles	-0.071 (0.055)	0.184*** (0.071)	0.303*** (0.064)	-0.292*** (0.091)	0.026 (0.019)	-0.061 (0.081)	0.297 (0.301)
	-0.054 (0.058)	0.163** (0.068)	0.353*** (0.054)	-0.364*** (0.088)			
	-0.054 (0.055)	0.210*** (0.076)	0.333*** (0.056)	-0.415*** (0.095)			
First 6 quantiles	-0.118** (0.052)	0.125* (0.072)	0.299*** (0.070)	-0.195** (0.082)	0.021 (0.019)	0.029 (0.079)	0.091 (0.268)
	-0.079 (0.049)	0.132* (0.074)	0.342*** (0.069)	-0.248*** (0.091)			
	-0.066 (0.051)	0.157** (0.076)	0.306*** (0.074)	-0.307*** (0.096)			
First 7 quantiles	-0.081 (0.058)	0.043 (0.089)	0.313*** (0.079)	-0.152* (0.088)	0.002 (0.022)	-0.019 (0.080)	-0.036 (0.297)
	-0.072 (0.057)	0.015 (0.087)	0.315*** (0.065)	-0.167** (0.082)			
	-0.082 (0.060)	0.039 (0.092)	0.311*** (0.075)	-0.202** (0.087)			
First 8 quantiles	-0.122* (0.072)	0 (0.107)	0.288** (0.118)	-0.191* (0.113)	-0.004 (0.024)	0.035 (0.084)	-0.002 (0.357)
	-0.117 (0.072)	-0.014 (0.108)	0.319*** (0.086)	-0.238** (0.108)			
	-0.108 (0.075)	-0.030 (0.110)	0.275*** (0.101)	-0.266** (0.114)			
First 9 quantiles	-0.102 (0.085)	-0.145 (0.101)	0.327** (0.142)	-0.082 (0.136)	-0.011 (0.029)	0.053 (0.117)	-0.077 (0.606)
	-0.069 (0.080)	-0.156 (0.108)	0.325** (0.140)	-0.126 (0.142)			
	-0.029 (0.084)	-0.125 (0.103)	0.268* (0.145)	-0.145 (0.135)			

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 $p \leq 1\%$

Analysis on the quantile level demonstrates that most of the estimates of parameters of F1 (site of the government) are not statistically significant, but the parameters of F2 (rule of law) are significant up to 7th quantile. Nonetheless, parameters of the indicators F3 (freedom to trade) are statistically significant demonstrating that relations between that freedom and economic growth are robust to the change of the level of development. The results of the F4 (regulation of domestic market) are paradoxical since on most of the quantiles there is a negative sign of 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 frontier, but the freedom from regulation can be.

The explanation could be that economic freedom foster competition and competition provides incentives for economic efficiency leading to the selection of the investment project that are more efficient, contribution to the growth by increasing TFP. Furthermore, competition pressure provides incentives for all undertakings to be efficient (both in terms of allocative and production efficiency) and level of inefficiency in the countries far away from the technological frontier is estimated to be so high that sustainable growth of TFP can be expected.

The other way to estimate the impact of democracy to 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 democracy index as explanatory variable. The second stage is to use the estimate of the each economic institution indicator (F1-R1P, F2-R2P, F3-R3P, F4-R4P) in the regression as explanatory variable, together with the residual of the first stage estimation (R1P, R2P, R3P R4P) in the regression model of growth rate as dependent variable and standard control variables GDP *per capita* and level of human capital. Accordingly F#-R#P is basically the effect to growth of the variance of the economic institution that can be explained by the variance of democracy and the R#P is the variance of the economic institution that cannot be explained by the variance of democracy, but of some other origin.

Table 12.

Two stage procedure, based on Polity IV

Dependent variable: five years average annual 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 13.

Two stage procedure, based on FH

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

Variable	(1)	(2)	(3)	(4)	(5)
Constant	48.271*** (6.786)	51.994*** (5.138)	43.343*** (7.027)	51.914*** (5.762)	47.217*** (5.357)
F1(-5)-R1F(-5)	-0.561 (0.779)				
R1F(-5)	0.250*** (0.067)				0.116* (0.067)
F2(-5)-R2F(-5)		-2.684 (1.886)			
R2F(-5)		0.171** (0.074)			0.165** (0.077)
F3(-5)-R3F(-5)			-0.143 (0.629)		
R3F(-5)			0.475*** (0.064)		0.396*** (0.067)
F4(-5)-R4F(-5)				0.188 (0.499)	
R4F(-5)				0.364*** (0.099)	0.076 (0.104)
GDP per capita (-5)	-5.589*** (1.252)	-4.719*** (1.362)	-5.223*** (1.224)	-6.541*** (0.916)	-5.972*** (0.601)
Secondary education (-5)	0.943** (0.401)	1.088** (0.501)	0.780 (0.505)	0.815* (0.474)	1.203*** (0.422)
Countries (observations)	123 (1134)	125 (1148)	123 (1138)	123 (1164)	121 (1093)
R squared	0.626	0.618	0.637	0.625	0.660
Adj. R squared	0.574	0.565	0.587	0.575	0.611

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

Table 14.

Two stage procedure, based on ANRR

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

Variable	(1)	(2)	(3)	(4)	(5)
Constant	44.293*** (4.074)	46.267*** (4.305)	39.309*** (4.224)	43.420*** (4.368)	42.924*** (4.688)
F1(-5)-R1A(-5)	-0.244 (0.762)				
R1A(-5)	0.216*** (0.069)				0.092 (0.068)
F2(-5)-R2A(-5)		-2.684*** (1.074)			
R2A(-5)		0.198*** (0.073)			0.127* (0.073)
F3(-5)-R3A(-5)			0.104 (0.363)		
R3A(-5)			0.434*** (0.064)		0.333*** (0.063)
F4(-5)-R4A(-5)				0.220 (0.423)	
R4A(-5)				0.396*** (0.096)	0.067 (0.102)
GDP per capita (-5)	-5.127*** (0.575)	-3.776*** (0.836)	-4.686*** (0.581)	-5.337*** (0.605)	-5.517*** (0.522)
Secondary education (-5)	0.439 (0.318)	0.513 (0.466)	0.205 (0.443)	0.377 (0.422)	1.309*** (0.396)
Countries (observations)	118 (1184)	119 (1162)	118 (1190)	118 (1174)	116 (1097)
R squared	0.575 0.521	0.583 0.528	0.580 0.527	0.595 0.542	0.631 0.579

- * 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 the economic institutions that influence economic growth – democracy only partially influences the economic institutions, so there are institutional changes that affects 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 insight that increase of economic freedom enhances competitions and in that way (Aghion and Griffith, 2005) that disables rents and in that way undermines incentives for investments. Nonetheless, the empirical results do not support this hypothesis as parameters of F3 and F4 are in the

regression with level of investment as dependent variable proved to be statistically significant and positive with all three specification of lagging.

Table 15.
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 investments for incumbents to keep-up with new entries and other incumbents. Furthermore, innovations are to the substantial extent implemented by investments in new capacities and hardware.

Finally, the important question is whether democracy influences economic growth directly, irrespectively of its influence to economic institutions. The hypothesis is that political stability is favourable to economic growth as it is beneficial for business decisions to invest and innovate, both speeding-up economic growth. A proxy for political stability thought is not index of democracy, but duration of interrupted democracy.

Table 16.

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

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	31.677*** (2.122)	42.312*** (2.923)	28.685*** (2.153)	39.415*** (3.159)	32.638*** (2.310)	43.330*** (3.352)
F1 (-5)		0.093 (0.054)		0.103 (0.065)		0.088 (0.064)
F2 (-5)		0.076 (0.070)		0.072 (0.070)		0.068 (0.070)
F3 (-5)		0.558*** (0.062)		0.569*** (0.063)		0.551*** (0.062)
F4 (-5)		0.137 (0.096)		0.168* (0.098)		0.122 (0.098)
Duration Polity IV	0.076*** (0.007)	0.022*** (0.007)				
Duration FH			0.040*** (0.008)	-0.002 (0.011)		
Duration ANRR					0.073*** (0.008)	0.028*** (0.011)
GDP per capita (-5)	-4.377*** (0.299)	-6.398*** (0.423)	-4.034*** (0.312)	-6.042*** (0.472)	-4.491*** (0.323)	-6.540*** (0.477)
Secondary education (-5)	0.994*** (0.146)	1.735*** (0.374)	1.218*** (0.148)	1.815*** (0.379)	0.961*** (0.143)	1.770*** (0.373)
Countries (observations)	203 (5158)	122 (1142)	203 (5158)	122 (1142)	203 (5158)	122 (1142)
R squared	0.348	0.584	0.334	0.581	0.347	0.5837
Adj.R squared	0.322	0.532	0.307	0.528	0.320	0.531

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

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

Table 17.

Quantile results for duration of democracy with three democracy indicators

Quantile	Duration Polity IV with F1-F4	Duration FH with F1-F4	Duration ANRR with F1-F4	Duration Polity IV	Duration FH	Duration ANRR
First quantile	0.005** (0.002)	0.004 (0.003)	0.007*** (0.003)	0.007*** (0.002)	0.002 (0.002)	0.004** (0.002)
First 2 quantiles	0.006*** (0.002)	0.005** (0.002)	0.007*** (0.002)	0.004*** (0.001)	0.002 (0.002)	0.004* (0.002)
First 3 quantiles	0.005*** (0.002)	0.004 (0.002)	0.006*** (0.002)	0.004*** (0.001)	0.002 (0.001)	0.003*** (0.001)
First 4 quantiles	0.004* (0.002)	0.001 (0.002)	0.003 (0.002)	0.002** (0.001)	0.000 (0.001)	0.001 (0.001)
First 5 quantiles	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)	0.002* (0.001)	-0.000 (0.000)	0.001 (0.001)
First 6 quantiles	0.000 (0.002)	-0.002 (0.002)	0.000 (0.002)	0.000 (0.000)	-0.001 (0.001)	0.000 (0.000)
First 7 quantiles	-0.003 (0.003)	-0.004 (0.003)	-0.003 (0.002)	-0.000 (0.000)	-0.001 (0.001)	-0.001 (0.001)
First 8 quantiles	-0.008*** (0.002)	-0.009*** (0.002)	-0.006*** (0.003)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
First 9 quantiles	-0.010*** (0.003)	-0.009*** (0.003)	-0.010*** (0.003)	-0.002 (0.001)	-0.004** (0.002)	-0.002 (0.002)

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

Since there are statistically significant estimates of the democracy duration parameters with positive sign at lower quantiles, i.e. for the countries close to the technology frontier. With inclusion of the countries with higher growth rates, countries that are far away from the technology frontiers, statistical significance fades away, only to reappear with the negative sign with inclusion of the countries with the highest growth rates, i.e. countries with the lowest income level. This provides some empirical evidence that democracy is good for growth for the countries that are close to the technology frontier, but bad for growth of the countries that are far away from the technology frontiers.

6. Robustness tests

The main econometric robustness test has already been implemented as three democracy indicators have been used in all regressions and eventually these indicators have been transformed to the democracy duration indicators.

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

7. Conclusion

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

Statistically significant estimates of all the three democracy indicators, both as self-standing or interactive term with the GDP *per capita* were recorded up to 6th quintile, but with inclusion of the countries with the higher growth rate, i.e. lower income the significance faded away. This results provide no support for the hypothesis that democracy is beneficial for the growth of 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 increase in democracy produced increase in size of the government, and in that increased tax burden, boost rule of law and increase 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 exception of the rule of law) and the lag of its effect to the economic institution.

The hypothesis that democracy is harmful for the growth of the countries far from the technological frontier is based on two explanation. The first one is that democracy increases the size of the government. Empirical results provided some evidence to support the insight that increase in democracy results in increased size of the government, nonetheless, no statistically significant negative impact of the size of the government to the growth rate has been recorded. Some of the estimation have even positive sign, though statistical significance is not robust. Though positive impact of the rule of law to economic growth has been empirically supported, with robust statistically significant estimates, the statistical significance of the relation between democracy and rule of law, although the signs are 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 as the consequence undermines the returns for the investments and decreases incentives for accumulation of the production factors as the main growth engine for the countries that are far away 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 for economic growth at all levels of development, though results for the freedom for regulation on the domestic market proved to more complicated with most of the estimations on the lower level of growth rate being statistically significant and negative, implying that increase of these freedoms is not beneficial for the 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 case can explained by a substantial part of the variation of the growth rate.

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

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

8. References

Acemoglu, D., Johnson, S., (2005), Unbundling Institutions, *Journal of Political Economy*, 113(5), pp. 949-995.

Acemoglu, D., Johnson, S. and Robinson J. A.,(2005) Institutions as the Fundamental Cause of Long-Run Growth, in: Philippe Aghion and Stephen Durlauf, *Handbook of Economic Growth*, Elsevier North Holland, 2005

Acemoglu, D, Aghion P. and Zilibotti F. (2006), Distance to Frontier, Selection, and Economic Growth, *Journal of the European Economic Association*, 4(1), pp. 37-74

Acemoglu, D., (2008), *Oligarchic vs. Democratic Societies*, *Journal of the European Economic Association* 6, pp. 1-44.

Acemoglu D., Naidu, S., Restrepo and P., Robinson J. A.,(2015), Democracy, Redistribution, and Inequality, *Handbook of Income Distribution*, Volume 2B, 2015 Elsevier B.V.

Aghion, P. and Griffith R., (2005), *Competition and Growth: Reconciling Theory and Evidence*, MIT Press, Cambridge and London.

Aghion *et al.*, (2008) Aghion, P., R. Burgess, S. J. Redding, and F. Zilibotti, 2008, The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India, *American Economic Review* 98, 1397-1412.

Alesina and Rodrik (1994), Distributive Politics and Economic Growth, *The Quarterly Journal of Economics* (1994) 109 (2): 465-490.

Alesina, A., Sule, O., Roubini, N. and Swagel, P.,(1996), Political instability and economic growth, *Journal of Economic Growth* 1(2): 189-211.

- Barro R., (1996), Determinants of Economic Growth, *NBER Working Paper 5698*, 10.3386/w5698
- Basher S.A. and Westerlund J. (2008), Is there really a unit root in the inflation rate? More evidence from panel data models, *Applied Economic Letters*, Vol. 15, 161-164.
- Boix, C., Miller, M. and Rosato, S. (2012), A Complete Data Set of Political Regimes, 1800–2007, *Comparative Political Studies*, November 26,
- Carmignani, F. (2003), Political Instability, Uncertainty and Economics, *Journal of Economic Surveys*, 17: 1–54. doi:10.1111/1467-6419.00187
- Cheibub, J. Antonio, Jennifer Gandhi, and James Raymond Vreeland. 2010. Democracy and Dictatorship Revisited, *Public Choice* 143 (1-2):67-101.
- Clague C., Keefer P., Knack S. and Olson, M., (1996). "Property and Contract Rights under Democracy and Dictatorship", *The Journal of Economic Growth*, 1:2, 243-276 (June)
- Djankov, S., Glaeser E., La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Djankov *et al.*, (2003), The new comparative economics, *Journal of Comparative Economics* 31,595–619
- Djankov, S., La Porta, R., Lopez-de-Silanes, F., Shleifer, A., (2002), The Regulation of Entry, *The Quarterly Journal of Economics*, Vol. CXVII, February, Issue1
- Giavazzi, F., and Tabellini, G., (2005) "Economic And Political Liberalizations," *Journal of Monetary Economics*, Vol. 52, 1297-1330.
- Gwartney, J., Lawson, R. and Hall J.,(2015), *Economic Freedom of the World: Annual Report* , Vancouver: Fraser Institute
- Grossman, S. J. and HART, O. D., (1983), An Analysis of the Principal-Agent Problem, *Econometrica*, Vol. 51, No. 1 (January)
- Haan, J. and Sturm J.E.,(2003), Does more democracy lead to greater economic freedom? New evidence for developing countries, *European Journal of Political Economy*, Volume 19, Issue 3, September 2003, Pages 547–563
- Im K.S., Pesaran M.H., Shin Y. (2003), Testing for unit roots in heterogenous panels, *Journal of Econometrics*, 115, 53-74.
- Jaunky V.C. (2013), Democracy and economic growth in Sub-Saharan Africa: a panel data approach, *Empirical Economics*, 45, 987-1008.
- Knutsen, C. H. 2013. "Democracy, State Capacity, and Economic Growth." *World Development* 43: 1–18. Kolstad, I., and T.
- Koenker R, and Bassett G. (1978), Quantile regression, *Econometrica* 46, 33-50.
- Lavigne, R. (2011) The political and institutional determinants of fiscal adjustment: Entering and exiting fiscal distress. *European Journal of Political Economy*, 27(1): 17-35
- Levin A., Lin C.F. and Chu J.C.S. (2002), Unit root tests in panel data: asymptotic and finite sample properties, *Journal of Econometrics*, 108, 1-24

- Lundstrom, S. (2005), The effect of democracy on different categories of economic freedom, *European Journal of Political Economy*, pp. 967-980.
- Maddala G.S. and Wu, S. (1999), A comparative study of unit root tests with panel data and a new simple test, *Oxford Bulletin of Economics and Statistics*, 61, 631-652 .
- Madsen, J., Raschky, P., *et al.*, (2015), Does Democracy Drive Income in the World, 1500–2000?, *European Economic Review*, Volume 78, August 2015, 175–195.
- Marshall, M.G. and Jagers, K., (2006), *Polity IV Project: Political Regime Characteristics and Transitions, 1800-2006*, Maryland: University of Maryland
- Mobarak A. M., (2005), Democracy, Volatility, and Economic Development, *Review of Economics and Statistics*, Vol. 87, No. 2, pp. 348-361.
- Murtin, F., Wacziarg, R., (2014), *The Democratic Transition*, Springer Science+Business Media, New York
- Oliva, M.A. and Rivera-Batiz L.A, 2002, Political Institutions, Capital Flows, and Developing Country Growth: An Empirical Investigation, *Review of Development Economics*, Volume 6, Issue 2, pages 248–262.
- Olson, M., (1993), Dictatorship, Democracy, and Development, *The American Political Science Review*, Vol. 87, No. 3 pp. 567-576
- Papaioannou, E. and Siourounis G., (2008), Democratisation and Growth, *Economic Journal*, Volume 118, Issue 532, pages 1520–1551,
- Persson T. and Tabellini G., (1994), Is Inequality Harmful for Growth?, *The American Economic Review* ,Vol. 84, No. 3 (June), pp. 600-621
- Persson, T. and Tabellini, G., (1995), Double-edged incentives: Institutions and policy coordination, *Handbook of International Economics*, in: G. M. Grossman & K. Rogoff (ed.), *Handbook of International Economics*, edition 1, volume 3, chapter 38, pages 1973-2030.
- Persson, T. (2005), “Forms of Democracy, Policy and Economic Development”, *NBER Working Paper*, No. 11171.
- Persson, T. and Tabellini, G., (2006). “Democracy and Development: The Devil in the Details”, *American Economic Review Papers and Proceedings*, 96, 319-324.
- Persson, T. and Tabellini, G., (2009), Democratic Capital: The Nexus of Political and Economic Change, *American Economic Journal: Macroeconomics* vol. 1, no. 2, July 2009 (pp. 88-126)
- Przeworski, A., Alvarez M. E., Cheibub J.A., Limongi, F (2000), *Democracy and Development: Political Institutions and Well-being in the World, 1950-1990*, New York: Cambridge University
- Przeworski, A., and Limongi. F., (1993). Political regimes and economic growth, *Journal of Economic Perspectives*, vol. 7, no. 3, Summer
- Rivera-Batiz, F. L., and Rivera-Batiz, L. A., (2002). "Democracy Participation, and Economic Development: An Introduction," *Review of Development Economics*, Wiley Blackwell, vol. 6(2), pages 135-50.

- Rodrik, D. and Wacziarg, R., (2005), "Do Democratic Transitions Produce Bad Economic Outcomes?," *American Economic Review Papers and Proceedings*, 95, pp. 50-56.
- Rodrik D., (1999), Where did all the growth go? External shocks, social conflict, and growth collapses, *Journal of Economic Growth* 4 (4), 385-412.
- Sonin, K., (2003), Why the rich may favor poor protection of property rights, *Journal of Comparative Economics*, Volume 31, Issue 4, December 2003, Pages 715–731.
- Sutter, M. (2003), The Political Economy of Fiscal Policy: An Experimental Study on the Strategic Use of Deficits, *Public Choice*, Volume 116, Issue 3, pp 313-332.
- Tavares, J., Wacziarg R. (2001) How democracy affects growth, *European Economic Review* 45 (2001) 1341-1378.
- Yang, B. (2008), Does Democracy Lower Growth Volatility? A Dynamic Panel Analysis, *Journal of Macroeconomics* Vol. 30 Iss. 1