



New College
of the Humanities

New College of the Humanities
19 Bedford Square
London WC1B 3HH
United Kingdom

Tel: +44 (0)20 7637 4550
info@nchlondon.ac.uk
nchlondon.ac.uk

New College
of the Humanities

Working Paper Series

Democratization and Inequality: Empirical Evidence for the OECD Member Countries

Sebastian Ille, Adrian Risso and
Edgar J Sanchez Carrera

Accepted (pre-proof) manuscript of: Sebastian Ille, Adrian Risso, Edgar J Sanchez Carrera: Democratization and inequality: Empirical evidence for the Organisation for Economic Co-operation and Development member countries, Environment and Planning C: Politics and Space, Volume: 35 issue: 6, page(s): 1098-1116

Final Version available on <https://doi.org/10.1177/0263774X16684521>

Democratization and Inequality: Empirical Evidence for the OECD Member Countries

Sebastian Ille (New College of the Humanities), Adrian Risso (Siena University) and
Edgar S Carrera (Siena University)

Abstract

The correlation between democracy and income inequality, as well as the direction of causation is still debated. In this paper, we conduct a dynamic panel data analysis for all 34 OECD member states over the period 1960-2012 and illustrate a non-monotonic relationship between inequality and democracy, as well as test the direction of causation by employing a non-causal homogeneity test in a panel Granger framework and the Dumitrescu and Hurlin non-causal heterogeneity test. We provide an explanation for the inverted U-shaped relation. In addition, we illustrate individual regression results for 12 exemplary OECD countries and provide a concise illustration of the economic and political changes to which countries have been subjected while elaborating the effect of the underlying policies on democracy and income equality.

Keywords: Democracy; Dynamic panel; Gini index; Inequality; Redistribution; Unified Democracy Scores.

JEL Codes: C23; P16, O10.

1. Introduction

Over the past decades, OECD countries have experienced a decrease in voter turnout and, at the same time an increase in the concentration of wealth. Similarly, the demand for socio-economic equality and for sharing the fruits of economic growth has been an essential motivator together with the strife for democratization at the outset of the Arab Spring. These examples, once again, illustrate the need to study the relationship between democracy and income inequality, since the way in which democratization and equality are correlated is still debated.

The sign of correlation and the direction of causation raise a number of questions in light of Piketty's (2014) recent and widely noticed work on rising income and wealth inequality, as well as Crouch's (2004) claim of states entering a period of post-democratization. If inequality determines the level of democracy, do recent trends in OECD countries contribute to democratization or are detrimental to it? If the direction of causation is reversed, is rising inequality a characteristic of a progressive or regressive democratization process? These questions lead to even more general ones, such as to whether a certain degree of inequality is required to maximize a country's level of democracy, or, on the contrary, whether the correlation between democracy and equality is not strictly positive, but even negative. The paper studies these questions, but also illustrates that answers cannot be given in a straight-forward manner. We build on previous research and show that the correlation between democratization and equality is non-monotonic, and both dimensions co-evolve.

Democracy is a mode of decision-making about collectively binding rules and policies. The lack of direct influence on political processes between elections and the inherently incomplete contract between citizens and ruling representatives leave leeway to the latter to shape policies according to their own benefit against the interest of the citizen.¹ In a similar way, the lack of freedom of expression, of pluralism in the media or of competitiveness of participation can distort the voters' perception of the consequences of policies and thereby inadvertently or deliberately affect policies in favor of a small minority.

A proper democratic process should thus minimize these frictions between citizens and policy makers by allowing for competitiveness, popular sovereignty, political equality, inclusiveness, and civil liberties. Therefore, a number of distinct aspects define the level of democracy in a country. In order to encompass these components, this paper uses the Unified Democracy Scores (UDS) as a proxy for democracy. The UDS incorporates 10 different measures that include a large variety of components of democracy, including those aforementioned, as well as political and civil rights, and the quality of elections.² However, the UDS does not include measures of the extensiveness of citizens in political participation nor their degree of political education and interest. We therefore see democracy more akin to Robert Dahl's earlier

¹ For example, Mexico was ruled by more than 70 years by the Institutional Revolutionary Party (PRI). This was called the perfect dictatorship ruling for years by actively co-opting voters and potential elite opponents..

² For general details on the UDS see <http://www.unified-democracy-scores.org>, for an illustration of the underlying measures of democracy, refer to <http://pan.oxfordjournals.org/content/early/2010/08/26/pan.mpq020/T1.expansion.html>

conception of polyarchy (see Dahl, 2013 and Krouse, 1982). Consequently, we consider that democratization is the process of rendering the form of governance more representative of the will of the majority of citizens subject to the components measured by the UDS. This definition is consistent with Beetham (1992). He defines democratization as an attempt to subject governments to popular control in order to favor the broad mass of the people.

In this paper, we analyze the correlation between UDS, as an index for democratization, and the country's Gini coefficients, as a representation for the level of equality in income distribution. The remainder of this paper is organized as follows. Section 2 provides a literature overview. In Section 3, we present our econometric model to empirically test the inverted U-shaped relationship. Subsection 3.1 illustrates the underlying data, which is analyzed in the following subsection 3.2. In subsection 3.3, we study and interpret the results of the inverted U-shaped correlation for some exemplary countries. Subsection 3.4 analyzes the direction of causality between income inequality and level of democracy. Section 4 concludes the paper.

2. Literature

Gradstein & Milanovic (2004) and Pengl (2013) provide an overview of the literature studying the link between equality and democracy. The sign of the correlation is however unclear. Earlier research by Lipset ([1960] 1981, chap. 2) pointed out a positive correlation between economic development and the degree of democracy, indicating that development alleviates differences among citizens. Recently, Solt (2008) offers an additional explanation. Across five advanced industrial democracies and in particular for lower income citizen, inequality at the national level reduces interest in politics, the frequency of political discussion, and the likelihood of having ever voted. On the other hand, Oliver (2001, chap. 3) finds that residents of more socioeconomically diverse communities tend to vote and engage in informal civic activity to a greater extent than residents of more homogeneous areas, implying a positive link between inequality and democratization. In addition, inequality at the municipal level appears to increase monetary donations or time spent for campaigns (Campbell 2006, chap. 3), and at the country level, to promote the likelihood of voting (Campbell 2006, chap. 2).

The process of democratization cannot be studied without considering the literature on social movements and collective actions. Marx (1958), in his analysis of the French Revolution of 1848, stresses the role of crises, which weaken the cohesion of elites, rendering them vulnerable to strikes and demands by the underclasses. Weber (1922) discusses the role of the division of labor according to input factors. In the absence of legitimate means to alleviate the resulting frictions, groups resort to the creation of social movements. Durkheim and Huntington bring similar arguments forward. Durkheim (1951) outlines the consequences of a rapid growth of prosperity and wealth. Rapid differentiation due to economic development disrupts the system of shared beliefs thereby leading to a state of disintegration and discontent. This is followed by a state of de-regulation and a demand to establish new beliefs. Huntington

(1968) similarly argues that conflict is a result of rapid change, with which existing political institutions cannot keep up, leading to questioning these institutions and mobilizing new political groups. Johnson (1966) defines similar essential elements of revolutionary change.

Rapid social and economic change, in addition to an incoherent elite lacking support and the means to implement conformity will lead either to the necessity to concede or to social movements. Either will eventually implement social change and potentially democratization. Thus, this literature does not only provide explanations for the results of this paper, but lays the foundation for the theoretical works of Acemoglu and Robinson (2000, 2001, 2006, 2015), as well as Boix (2003). Acemoglu and Robinson (2000) distinguish between two political groups with divergent interests. Under the threat of social conflict, rich concede to the demands of the poor, and thereby agree to democratize and commit to a moderate redistribution to avoid a revolution. As a consequence, the poor are able to redistribute wealth by imposing higher taxes on the rich. The poor thus struggle for democratization, while the elites have strong incentives to oppose it. Acemoglu and Robinson (2001) argue that inequality is therefore the essential determinant of democratization. If inequality is high, costs are low both for the rich to launch a coup and the poor to organize social movements. The have-nots have little to lose if their instigation fails (apart from their lives), whereas the rich have strong means to oppress the poor and turn the social contract even more to their favor. The institutional framework will therefore be fragile and unable to support democratization. On the other hand, higher levels of equality entail higher costs for the poor if their social movement failed while facing lower deprivation, while the rich would need to concede little to reach a more egalitarian social contract. Equality therefore consolidates democratic institutions. Similarly, Acemoglu and Robinson (2006) sustain that equality promotes democracy. Also Boix (2003) shows that more equal societies are more likely to democratize, given that the cost for social elites to concede is lower. In essence, a minimum level of inequality is required for social change and the strife for democratization ensuring the willingness to compromise, whereas too high levels of inequality will persistently destabilize a democracy.

In this regard, Acemoglu & Robinson (2000) illustrate an inverted U-shaped correlation between equality and gains from revolution. In addition, Acemoglu et al. (2015) illustrate the inconclusive results in existing literature on the correlation between inequality and democracy, and show a slight, but significantly negative impact of democracy on the gross Gini coefficient, but no consistent and significant effect on net Gini or other measures of inequality. Yet by building on their previous paper (Acemoglu & Robinson, 2000), Acemoglu and Robinson (2006) develop a theory of an inverted U-shaped relationship between inter-group equality and democratization, which is consistent with the classic literature on collective action and can explain the inconclusive empirical results in prior literature: highest levels of democracy are predominant at moderate levels of inequality, while autocracies occur at very low and high levels of inequality. At intermediate levels of equality, elites are pressured to liberalize and to redistribute at moderate and acceptable levels rather than paying the cost of repression under continued autocracy. Empirical evidence by Esptein et al. (2006) is consistent with the inverted-U shape hypothesis.

Other previous papers illustrate ambiguous results and do not replicate an inverted u-shaped relationship. This is either caused by the difference in model specification or the used data set. Teorell (2010) does not

find a significant impact of inequality on democratization, but does not provide a detailed exposition of his model nor data. Reenock et al. (2007) and Aléman and Yang (2011) use hazard rate as a dependent variable instead of a democracy measure. Houle (2009) relies on a binary dependent variable (democracy and autocracy), and supports the assumption that higher inequality reduces the probability of a sustainable democracy. Freeman and Quinn (2012) use an IMF indicator for a government's policy stance toward capital account liberalization and use as dependent variable a measure for democracy changes based on Polity IV and Regime from 1955-2004. They find the inverted u-shaped relationship for financially closed autocracies, but not for financially integrated autocracies. In addition, it should be stressed again that our study only focuses on OECD countries and can therefore not be generalized to other countries.

The aim of this paper is to empirically test the inverted U-shaped correlation for the group of OECD countries over the period 1960-2012. By choosing UDS as a proxy for democracy and thus, as the dependent variable, we test the hypothesis using dynamic panel methodologies. Our study is based on: i) a dynamic panel data model using the difference generalized method of moments (GMM) framework proposed by Arellano and Bover (1995) and Blundell and Bond (1998)³; and ii) Country Fixed Effects (FE) and Random Effects (RE) procedures. The FE model controls for time-invariant attributes of states that might be correlated with both inequality and the propensity to democratize. The RE procedure, unlike the fixed effects model, assumes random variation across entities/countries which are uncorrelated with the predictor or independent variables. In addition, we do a Hausman test with the null hypothesis being the preferred model is RE vs. the alternative FE.

3. Empirical analysis: econometric model and estimation results

We conduct a dynamic panel data analysis for all OECD countries for the period between 1960- 2012 to test for the inverted U-Shape relationship between democracy and income inequality. Equation (1) introduces democratization as a quadratic function of the Gini index:

$$Democratization_{i,t} = \alpha_{i,0} + \alpha_1(Gini)_{i,t} + \alpha_2(Gini)_{i,t}^2 + v_{i,t} \quad (1)$$

Concavity implies that $\alpha_2 < 0$ and the strictly positive domain of the Gini coefficient requires that $\alpha_1 > 0$. The maximum coefficient is given by $Gini^* = -\alpha_1/(2\alpha_2)$ with a maximum level of Democracy at $\alpha_0 - (\alpha_1^2/4\alpha_2)$. In order to take account of the impact of economic growth and changes in the organization of production, we include real GDP and human capital (HC) into equation (9) leading to:

$$Democratization_{i,t} = \alpha_{i,0} + \alpha_1(Gini)_{i,t} + \alpha_2(Gini)_{i,t}^2 + \alpha_3(GDP)_{i,t} + \alpha_4(HC)_{i,t} + v_{i,t} \quad (2)$$

³ This estimator is better than Arellano and Bond (1991), especially if the variables are close to a random walk.

In order to obtain an empirical relation for equation (2) we apply the difference generalized method of moments (GMM) framework, as proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator overcomes a potential weakness in the Arellano and Bond (1991) DPD estimator. Instead of only lagged levels, which are often poor instruments for first differenced variables, especially if they follow a random walk, the estimator includes lagged differences in addition to lagged levels. Although the present estimation includes variables such as GDP that generally presents unit root processes, we will also estimate the Arellano-Bond DPD without considering GDP and HC in order to compare results to the Arellano-Bover/Blundell-Bond method. In addition, we estimate Fixed Effects (FE) and Random Effects (RE) in order to compare resulting coefficients, using the corresponding FE and RE functional general form, given by:

$$\ln(Democratization)_{i,t} = \alpha_i + \beta_1 \ln(Gini)_{i,t} + \beta_2 (\ln(Gini)_{i,t})^2 + \beta_3 \ln(GDP)_{i,t} + \beta_4 \ln(HC)_{i,t} + \mu_i + \varepsilon_{i,t} \quad (3)$$

where $\ln(Democratization)_{i,t}$, $\ln(Gini)_{i,t}$, $\ln(GDP)_{i,t}$, and $\ln(HC)_{i,t}$ respectively define the natural logarithm of the level of Democracy, the Gini index, the real GDP or the real per capita GDP, and the human capital in country i during year t . The fixed effects decomposition of the error term is given by $v_{i,t} = \mu_i + \varepsilon_{i,t}$ with μ_i being the country-specific effect and $\varepsilon_{i,t}$ the error component of the model. Variables $\ln(GDP)_{i,t}$ and $\ln(HC)_{i,t}$, are applied to control the robustness of the model. We will use RE models in the presence of correlation between the explanatory variables ($\ln(Gini)_{i,t}$ and $(\ln(Gini)_{i,t})^2$) and the country-specific effect (μ_i), i.e., if unobserved characteristics are uncorrelated with explanatory variables. In the case in which correlation differs from zero, we use fixed effects estimation.

If a model for panel data includes lagged dependent explanatory variables, the simple estimation procedures are asymptotically valid only when there are a large number of observations in the time dimension (T). The currently available response to this problem (Arellano & Bond, 1991; Holtz-Eakin, 1988; Hsiao, 2003) is to first difference the equation to remove individual effects and then estimate using instrumental variables (IV), given by the values of the dependent variable. This treatment leads to consistent but not efficient estimates, because it does not make use of all the available moment conditions. Hence, we use the difference-generalized method of moments (GMM) framework proposed by Arellano and Bover (1995) and Blundell and Bond (1998) as mentioned before, estimating the following equation:

$$\Delta \ln(Democratization)_{i,t} = \beta_1 \Delta \ln(Democratization)_{i,t-1} + \beta_2 \Delta \ln(Gini)_{i,t} + \beta_3 \Delta (\ln(Gini)_{i,t})^2 + \beta_4 \Delta \ln(GDP)_{i,t} + \beta_5 \Delta \ln(HC)_{i,t} + \Delta \varepsilon_{i,t} \quad (4)$$

with country $i=1, 2, \dots, n$ at year $t=1, \dots, T$ and all the variables being first differences, i.e. $\Delta \ln X_{i,t} = \ln X_{i,t} - \ln X_{i,t-1}$ for all variables $X = (Democratization, Gini, GDP, HC)$. Because of the double-logarithmic form

of the model, its parameters can be interpreted as elasticities. Parameter β_1 indicates to what degree current Democratization is determined by the value of previous Democratization. By using a dynamic model, we measure both short-run and long-run elasticities, where the estimated coefficients are short-run elasticities. Long-run elasticities are obtained by dividing each of the coefficients by $(1 - \beta_1)$. In addition, we avoid the problem of non-stationarity by differencing the data.

3.1 Data

The dataset includes two main variables (Gini and democratization), as well as real gross domestic product (GDP), the real per capita GDP (PCGDP) and human capital (HC) for 34 OECD countries⁴ for the period 1960-2012:

1. Income inequality is measured by the Gini index and denoted by *Gini*. Data is derived from the Standardized World Income Inequality Database, Version 4.1 by Frederick Solt (2014), Southern Illinois University. We use the variable called *gini-net*, which is an estimate of Gini index of inequality in “equivalized” (square root scale) household disposable income, using Luxembourg Income Study data as the standard. The Gini index is expressed in natural logs which we square for the quadratic term.
2. Democratization is measured by the Unified Democracy Scores, *UDS*, developed by James Melton, Stephen Meserve, and Daniel Pemstein (2010). UDS aggregates the information contained in various other democracy scores, such as Polity IV, DD, Freedom House, and others. Computation of the UDS is based on weighted maximum likelihood regressions and a higher score indicates a more democratic system. For our sample of countries, the scores take values between -1.28 and 2.26. In order to apply natural logarithms, we add the value 2 to the index and thereby render its domain strictly positive. In this way the model will consider the variable $\ln(\text{UDS}+2)$ avoiding the impossibility to compute logarithms of negative values. We use a country’s year “mean” or “median” variable in the UDS summary scores file, equivalent to the Polity Score or Freedom house value generated by the UDS. It features a single mean or median observation of democracy for each country and year. Moreover, the Bayesian multi-rater approach of Pemstein et al. builds on the restrictive assumption that the rating errors of the component measures are of a non-systematic nature. As noted by these authors in the conclusion, an approach that takes systematic bias in individual measures into account could lead to more reliable and valid latent measures of democracy. As this makes it necessary to detect and model biases in existing measures of democracy, the UDS are a reasonable if not perfect proxies for democratization as defined above. Data are available at <http://www.unified-democracy-scores.org/uds.html>

⁴ The countries included in our sample are: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (South), Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

3. Real Gross Domestic Product (GDP) is obtained considering the variable *rgdpe* in the Penn World Table, version 8.0. This variable represents the expenditure-side real GDP at chained PPPs (in mil. 2005US\$). In addition, it is considered the real per capita GDP (PCGDP) by dividing *rgdpe* by the variable *pop* (population in millions) from the same dataset.
4. Human Capital (HC) is obtained from the variable *hc* in the Penn World Table, version 8.0. The variable represents the index of human capital per person, based on years of schooling, as in Barro and Lee (2012), and returns to education, as in Psacharopoulos (1994).

Table 1 contains the descriptive statistics for the main variables (median, standard deviation, minimum and maximum), which we use in our econometric model.

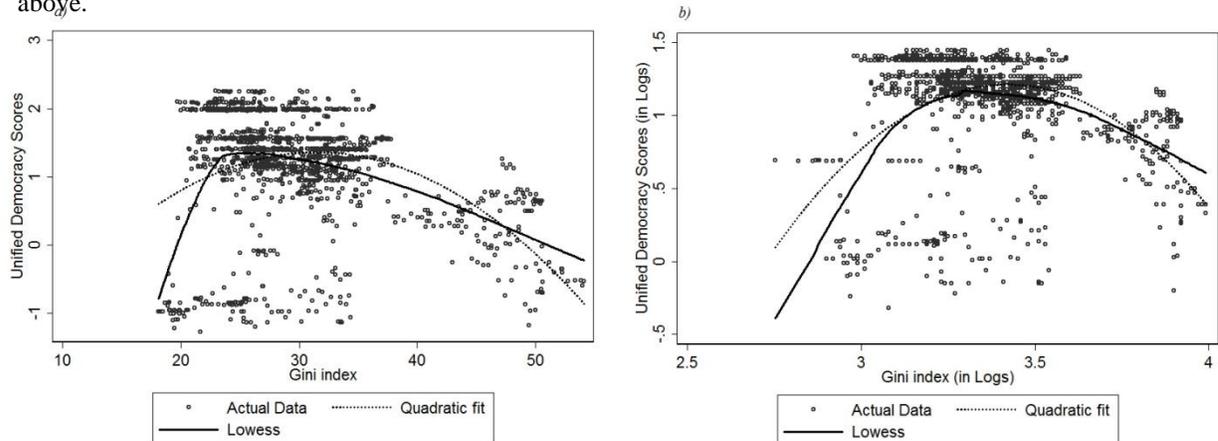
Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Year	-	-	1960	2012	1802
Democracy	3.10	0.87	0.72	4.26	1734
Gini	29.44	6.87	15.69	54.12	1571
GDP	671,931	1,529,447	1,712	13,400,000	1628
PCGDP	19,299	10,567	1,071	81,683	1628
HC	2.70	0.47	1.27	3.62	1648

Note that the wide range in the GDP is due to a minimum GDP of US\$ 1,712 (mil. 2005US\$) corresponding to Iceland in 1960 with a population of 175,857 inhabitants (US\$ 9,736 per capita) and the maximum corresponds to US in 2007 with US\$ 13,400,000 (mil. 2005US\$) with a population of 302,284,564 of inhabitants (US\$ 44,372 per capita). However, note that minimum per capita GDP corresponds to South Korea in 1960 (US\$ 1,071) and the maximum is Luxembourg in 2008 (US\$ 81,683). Consider that some countries have missing values, for instance the gini index for Mexico starts in 1963. For this reason the work is made applying an unbalanced panel data.

Figure 1 plots the UDS in relation to the Gini index for the entire data set for the period 1960 to 2012. The dashed smooth curve line is the OLS of democratization on a quadratic Gini, and the solid line is fitted by nonparametric regression. Figure 1 a) considers the variables in levels and Figure 1 b) presents the values in logs.

Figure 1. The UDS and Gini index: an inverted U-shape. Source: Own elaboration with the data described above.



Note that Figure 1 illustrates that the quadratic relationship between democracy and income inequality follows an inverted U, indicating a maximum after which the relationship changes sign, turning from positive to negative. Moreover, the nonparametric regression also returns an inverted U-shaped correlation, which is even more apparent when the variables are taken in logarithms.

3.2 Empirical Results

Returning to equations (3) and (4), we apply the Arellano-Bond and Arellano-Bover/Blundell Bond methodology. In addition, depending on the Hausman test we present the Fixed or Random Effect model in order to compare results.

The panel unit root test checks for non-stationarity which would suggest the application of panel data cointegration. Table 2 shows the panel unit root test results after applying four tests (Levin, Lin and Chu t; Im, Pesaran and Shin W-stat; ADF -Fisher Chi-square; PP-Fisher Chi-square) to the Gini, Democracy, GDP, PCGDP and human capital. Three of the four tests suggest a rejection of the null hypothesis for the case of Gini, whereas all tests reject the null hypothesis for Democracy. In the case of the control variables, one test suggests stationarity for PCGDP and two tests suggest stationarity for GDP while three tests suggest the same for human capital. It is therefore not necessary to apply cointegration techniques and we use the FE, RE, Arellano-Bond and Arellano-Bover/Blundell Bond methodology. In particular, the latter method is better than Arellano-Bond when variables are close to a random walk, with GDP and PCGDP being generally considered as non-stationary, (here two of four test support this result).

Table 2. Panel Unit Root Test for the variables Gini, Democratization, GDP and Human Capital.

Ln(Democratization)			
Method	Statistic	Prob. (a)	Obs.
<i>H0: Unit root (assumes common unit root process)</i>			
Levin, Lin & Chu t	-1.7163	0.043*	1700
<i>H0: Unit root (assumes individual unit root process)</i>			
IM, Pesaran and Shin W-stat	-2.1006	0.018*	1700
ADF-Fisher Chi-square	91.9570	0.028*	1700
PP-Fisher Chi-square	156.8880	0.000*	1768
Ln(Gini)			
Method	Statistic	Prob. (a)	Obs.
<i>H0: Unit root (assumes common unit root process)</i>			
Levin, Lin & Chu t	-4.1543	0.000*	1428
<i>H0: Unit root (assumes individual unit root process)</i>			
IM, Pesaran and Shin W-stat	-3.7209	0.000*	1428
ADF-Fisher Chi-square	123.0400	0.000*	1428
PP-Fisher Chi-square	56.5457	0.838	1515
Ln(HC)			
Method	Statistic	Prob. (a)	Obs.
<i>H0: Unit root (assumes common unit root process)</i>			
Levin, Lin & Chu t	-7.4629	0.000*	1546
<i>H0: Unit root (assumes individual unit root process)</i>			
IM, Pesaran and Shin W-stat	-1.0965	0.1364	1546
ADF-Fisher Chi-square	139.286	0.000*	1546
PP-Fisher Chi-square	282.35	0.000*	1614
Ln(GDP)			
Method	Statistic	Prob. (a)	Obs.
<i>H0: Unit root (assumes common unit root process)</i>			
Levin, Lin & Chu t	-7.7115	0.000*	1526
<i>H0: Unit root (assumes individual unit root process)</i>			
IM, Pesaran and Shin W-stat	0.5647	0.7139	1526
ADF-Fisher Chi-square	64.8764	0.585	1526
PP-Fisher Chi-square	109.2330	0.0011*	1594
Ln(PCGDP)			
Method	Statistic	Prob. (a)	Obs.
<i>H0: Unit root (assumes common unit root process)</i>			
Levin, Lin & Chu t	-6.79788	0.000*	1526
<i>H0: Unit root (assumes individual unit root process)</i>			
IM, Pesaran and Shin W-stat	0.73776	0.7697	1526
ADF-Fisher Chi-square	59.8838	0.7479	1526
PP-Fisher Chi-square	82.9734	0.1045	1594

Source: Own calculations. *Rejection of the null hypothesis at 5%. (a) Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

At a second stage, the FE and RE models are estimated. The Hausman test rejects the RE model (Chi2 = 20.68 with a p-value = 0.0004) and we apply the FE model. The Arellano-Bond model was estimated for the restricted model considering democratization and Gini, and for both specification with and without considering GDP and Human Capital. The Sargan test fails to reject the null hypothesis of over-identifying restrictions in the GMM-Difference and System GMM-Difference estimated models. In addition, the null of autocorrelation was rejected by the Arellano-Bond test for serial correlation.

Table 3 shows the estimation results of equation (4) including the fixed effects (FE), the Arellano-Bond and the Arellano-Bover/Blundell-Bond estimation. In all these cases, an inverted U-shape defines the relationship between Democratization and Gini.

Table 3. Fixed Effects and Arellano Bond estimation for the OECD countries

	$\ln(\text{Democratization})_{i,t}$				
	Fixed Effect (1)	Arellano-Bond (2)	Arellano-Bover/ Blundell-Bond (3)	Arellano-Bover/ Blundell-Bond (4)	Arellano-Bover/ Blundell-Bond (5)
$\ln(\text{Democratization})_{i,t-1}$		0.8834 (44.32)***	0.8824 (54.41)***	0.8459 (29.81)***	0.8391 (28.28)***
$\ln(\text{Gini})_{i,t}$	5.5717 (1.25)	1.6476 (2.56)***	2.2476 (3.68)***	1.5489 (2.23)**	1.5139 (2.06)**
$(\ln(\text{Gini}))_{i,t}^2$	-0.7544 (-1.15)	-0.2346 (-2.48)***	-0.3312 (-3.75)***	-0.2318 (-2.33)**	-0.2271 (-2.15)**
$\ln(\text{GDP})_{i,t}$	0.0401 (0.54)			0.0066 (1.13)	
$\ln(\text{HC})_{i,t}$	0.6949 (1.57)			0.0728 (2.42)**	0.0109 (0.25)
$\ln(\text{PCGDP})_{i,t}$					0.0270 (2.64)***
c	-10.2354 (-1.31)	-2.7423 (-2.55)***	-3.6611 (-3.53)***	-2.5499 (-2.14)**	-2.5971 (-2.06)**
<i>Wald chi2 (Prob>0)</i>	6.55 (0.0005)	4944.29 (0.0000)	9920.04 (0.0000)	2788.75 (0.0000)	2069.89 (0.0000)
<i>autocorrelation test</i>	48.381 (0.0000)	Order 1: -4.0578 (0.0000) Order 2: 1.4142 (0.1573)	-4.0531 (0.0001) 1.4298 (0.1528)	-3.7449 (0.0002) 2.0894 (0.0367)	-3.7576 (0.0002) 2.0839 (0.0372)
<i>Sargan test</i>		$\text{chi2}(1163) = 1069.86$ 0.9757	$\text{chi2}(1214) = 1290.219$ 0.0631	$\text{Ch2}(1186)=1235.308$ 0.1557	$\text{Ch2}(1186)=1239.733$ 0.1355
<i>N</i>	1466	1506	1559	1455	1455

t statistics in parentheses () and p-value in square brackets []. ** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Source: own calculations

These estimations imply the following results:

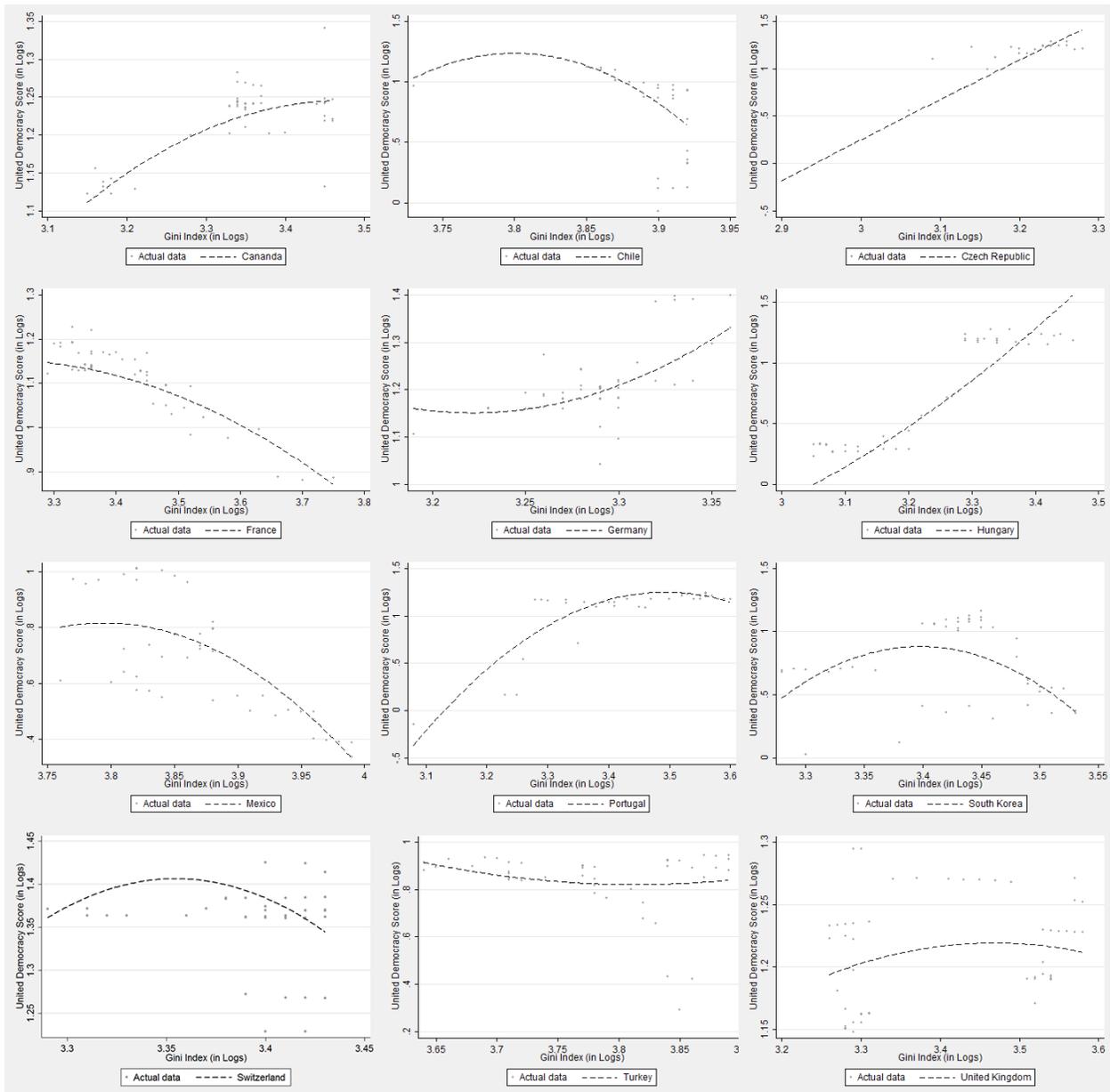
1. In the case of FE, no variable is significant and the data is autocorrelated.
2. In the case of the Arellano-Bond model in column (2) in Table 3, all the variables are significant and signs are as expected. The Sargan test does not detect over-identification nor autocorrelation.
3. The Wald test for Arellano-Bover/Blundell-Bond estimation in column (3), (4), and (5), considering the model with and without the real GDP, real per capita GDP and human capital, respectively, indicates that GDP and HC are significant (Chi2(2)=7.38 with a p-value 0.0249) and PCGDP and HC are also significant (Chi2(2)=13.86 with p-value 0.001). The coefficients are short-run elasticities. Since in the long-run $\ln(Democratization)_{i,t} = \ln(Democratization)_{i,t-1}$, elasticities are obtained by dividing each of the estimated coefficients by $(1 - \beta_1)$ for the model in column (4) and (5).
4. Past democratization is important for explaining the current democratization in OECD countries, accounting for 84.59% of the current score or 83.91% when considering per capita GDP. Long-run coefficients for $\ln(Gini)$ and $\ln(Gini)^2$ are 9.4074 and -1.4115, respectively in the model of column (5).
5. The maximum level of democracy in the Arellano-Bover/Blundell-Bond estimation is obtained at a Gini* equal to 28.00 in the model of column (5). This value is close to the coefficients for Austria (28.12) and Germany (28.43) in 2012. The maximizing Gini without considering the effects of GDP and HC is 29.76.

Although we obtained support for the assumption of an inverted U-Shaped relationship between democratization and inequality, we have neglected the causal direction of both variables. We postpone the analysis to subsection 3.4.

3.3 Case study

In this section we briefly illustrate individual regressions for a small sample of countries, with different degrees of GDP and economic development, and distinct political and economic histories. In figure 2, we observe that an inverted U-shaped relationship does not consistently hold for all countries.

Figure 2. Case study where an inverted U-shaped relationship does not consistently hold for all countries



Two of the studied countries illustrate a strongly positive impact of inequality on democracy, the Czech Republic and Hungary. These two countries have been part of the former Eastern bloc and have undergone a fundamental economic transformation in addition to a political transition in the 1990s. On 1 January 1993, the Republic of Czechoslovakia, which existed since the end of World War I, split into the independent states of Slovakia and the Czech Republic, followed by a transition from a centrally planned economy to a market economy. Similarly, Hungary has prospered more than most of the other satellite states due to its partially free-market command economy and its attractiveness for tourists east of the Iron Curtain. Yet, Hungary played a vital role for the fall of the latter in 1989 and has experienced turbulent economic and political changes since then.

Furthermore, Germany and Turkey illustrate a U-shaped relationship. Analogous to the former two countries, Germany and Turkey have also undergone significant economic and political transformations. Germany has been reunified in 1990 followed by privatization and closing down or acquisitions of a majority of former Eastern companies. High unemployment coupled with lower wage of former Eastern Germans had a significant impact on income disparity. Turkey abandoned its economic doctrine of statism and lifted restrictions on foreign trade, direct investment and exchange rate with the market reform under Özal in 1983. All four countries have experienced changes of the political system in these years but also concomitant fundamental economic systemic changes. Restricting the data set to years after the economic transformation processes set in, restores the inverted U-shaped correlation for all 4 countries. Furthermore, we observe that, with the exception of Turkey, all countries underwent an upsurge in the UDS at the cost of an increased Gini coefficient.

The United Kingdom is the world's fifth-largest economy by nominal GDP. Labor market reforms under Thatcher during the 1980s shifted the Gini coefficient from 26.73 to 32.80 but kept UDS levels high at 1.55 (apart from a slump to an UDS of 1.25 after a regime shift in 1990). After the 2000s, both Gini coefficient and UDS values picked up making the UK a country that exhibits high levels of democracy and of income equality close to the optimum values.

Switzerland has undergone a “Revitalisation Programme” after its rejection of joining the European Economic Area in 1992, which included a number of agreements with the European Union and sectoral reforms that positively affected income equality (from a Gini of 30.70 in 1992 to a Gini of 26.80 in 2004), but had little impact on its high UDS level (at approximately 1.99). Market deregulation and stronger integration with the global economy has increased its Gini to levels above 29.74 and led to a fluctuation of the UDS in the second half of the 2000s (with a minimum at 1.39 and a maximum at 2.25).

Mexico has been in the decreasing part of the inverted U-shaped curve during the period 1963-2012. Debt financed subsidies in the 1970s along with additional oil revenues and foreign borrowing, social demands were silenced, but led to severe negative economic and social consequences for the next decade. Trade liberalization and the inability to finance further subsidies did not help to compensate the devaluation pressure

on the Mexican currency “el peso”. Yet, the recurrent crises triggered reforms that limited state intervention in market activities and fostered investment, production and trade, in addition to social reforms in the context of the signing of the trilateral free trade agreement between Mexico, USA and Canada (NAFTA). These reforms resulted in the creation of institutions such as the National Human Rights Commission, the Federal Electoral Institute and the Federal Electoral Tribunal in 1990, which can be considered a first step in the democratization process of Mexico.

4. Panel Granger causality test

There are a number of different approaches to test causality in a panel context. Most of them differ with respect to the assumptions about the homogeneity of the coefficients considered across countries. In this section, we apply the Granger causality test for panel data and consider two approaches for assessing non-causal homogeneity in a panel Granger framework:

- 1 The first approach is to treat the panel data as one large stacked set of data, and then perform the Granger Causality test in the standard way, with the exception of not letting data from one cross-section enter the lagged values of data from the next cross-section. This method assumes that all coefficients are the same across all cross-sections;
- 2 A second approach is suggested by Dumitrescu and Hurlin (2012), following the opposite assumption that all coefficients are different across cross-sections. Dumitrescu and Hurlin’s test of homogeneous non-causality assumes, under the null, that there is no causal relationship for any of the units of the panel and considers a heterogeneous panel data model with fixed coefficients (in time). It also specifies the alternative hypothesis as heterogeneous causality, which assumes that there is a causal relationship from x to y for at least one subgroup of individuals.

Two caveats complicate the analysis. The estimated relationship is not bijective. The quadratic relation under the assumption that inequality causes democracy implies an inverted function composed of two expressions in square roots. Secondly, available causality tests are designed to test causality between two variable, yet the model includes more than two variables. For these reasons, we focus on the causality between democracy, Gini and Gini-square.

Table 4 shows the results for the first Granger causality test under the assumption of homogeneous coefficients for all OECD countries, indicating no causality.

Table 4. Causality test assuming the homogeneity of coefficients.(OECD)

Null Hypothesis:	F-Statistic	Prob.
<i>ln(Gini) does not Granger Cause ln(Democratization)</i>	0.54466	0.4606
<i>ln(Democratization) does not Granger Cause ln(Gini)</i>	1.32232	0.2504
<i>ln(Democratization) does not Granger Cause ln(Gini)²</i>	1.34448	0.2464
<i>ln(Gini)² does not Granger Cause ln(Democratization)</i>	0.62618	0.4289

Source: Own calculations. One lag was considered. *Rejection of the null hypothesis

Dumitrescu and Hurling (2012) point out that the assumption of homogeneous coefficients β_i leads to fallacious inference, since a homogeneous specification of the relation between the studied variables does not allow for interpreting causality if it differs across countries (i.e., the direction of causation shifts between countries). Therefore, we test the Homogeneous Non-Causality (HNC) hypothesis by taking into account the heterogeneity of both the regression model and of the causal relation. Table 5 shows the results according to the test following Dumitrescu and Hurlin (2012).

Table 5. Causality test assuming the heterogeneity of coefficients. (OECD)

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
<i>ln(Gini) does not homogeneously cause ln(Democratization)</i>	3.40401	8.8255	0.000*
<i>ln(Democratization) does not homegeneously cause ln(Gini)</i>	4.40124	12.5697	0.000*
<i>ln(Democratization) does not homegeneously cause ln(Gini)²</i>	4.40076	12.5678	0.000*
<i>ln(Gini)² does not homogeneously cause ln(Democratization)</i>	3.42207	8.89332	0.000*

Source: Own calculations. One lag was considered. *Rejection of the null hypothesis

Assuming heterogeneity of the coefficients between countries, each direction of causality is supported for at least one country. Since a causality test of the individual time series for each of the 34 countries is not performed due to the number of observations, we are unable to assess whether a bi-directional causation exists or whether inequality affects democracy in some countries and the inverse holds true in others.

Table 6. Arellano Bond estimation Gini depending on Democratization for the OECD countries

	$\ln(Gini)_{i,t}$		
	Arellano-Bover/ Blundell-Bond (1)	Arellano-Bover/ Blundell-Bond (2)	Arellano-Bover/ Blundell-Bond (3)
$\ln(Gini)_{i,t-1}$	0.9315 (72.46)***	0.9165 (43.45)***	0.9115 (45.80)***
$\ln(Democratization)_{i,t}$	0.0165 (0.84)	-0.0114 (-0.52)	-0.0091 (-0.40)
$(\ln(Democratization)_{i,t})^2$	-0.0051 (-0.42)	-0.0002 (-0.01)	-0.0037 (-0.29)
$\ln(GDP)_{i,t}$		-0.0056 (-1.61)	
$\ln(HC)_{i,t}$		0.0673 (3.42)***	0.0559 (2.65)***
$\ln(PCGDP)_{i,t}$			-0.0015 (-0.29)
c	0.2204 (5.91)***	0.2994 (4.06)***	0.2748 (3.79)***
<i>Wald chi2 (Prob>0)</i>	14349.35 (0.0000)	2492.42 (0.0000)	3170.75 (0.0000)
<i>autocorrelation test</i>	-3.0437 (0.0023) -0.90569 (0.3651)	-3.7881 (0.0002) -0.60587 (0.5446)	-3.7909 (0.0002) -0.60092 (0.5479)
<i>Sargan test</i>	$chi2(1214) =$ 3261.598 0.0000	$Ch2(1186)=3164.659$ 0.0000	$Ch2(1186)=3201.825$ 0.0000
N	1515	1419	1419

t statistics in parentheses () and p-value in square brackets []. ****p* < 0.01, ***p* < 0.05, **p* < 0.10. Source: Author's calculations

Since the causality test suggests the possible existence of bidirectional causality, we estimate whether the Gini depends on democratization. Table 6 shows the results of a regression with a quadratic impact of Democratization and a linear impact of real GDP, real per capita GDP and human capital. The coefficients of democratization are not significant in any model. The Wald test supports the additional explanatory value of human capital and real GDP (Chi2(2) is 12.05 with p-value 0.0024) and the additional explanatory value of human capital and real per capita GDP (Chi2(2) is 115.17 and p-value 0.0000). Results suggest that democratization does not significantly change inequality, whereas human capital is significantly and positively correlated with inequality.

5. Conclusion

The paper studies the correlation between income inequality and democratization. It finds robust results that empirically support an inverted U-shaped relation between both variables for OECD countries during the period from 1960 to 2012. Consistent with theoretical literature, this suggests the existence of a democracy maximizing level of equality. This is supported by our finding of an average optimal level of democracy at a Gini coefficient of roughly 28.00 (or 3.3323 in natural logs), indicating that a small level of income inequality benefits democratization.

As illustrated before, high levels of inequality, on the other hand, decrease the costs of social movements and of mounting an overthrow, destabilizing any democracy and rendering it unsustainable. At the same time, high levels of equality unravel class barriers and render the existence of an elite less apparent. However, the struggle between an elite and those feeling deprived drives the process of democratization. Thus at low levels of inequality, less can be gained from such struggle leaving little desire to aspire towards even higher equality, whether through social movements or political debate. This interpretation is supported by the lower voter turnout in recent decades in OECD countries exhibiting high levels of equality.

However, the data also shows that no generally valid level of democracy maximizing equality exists, but each of the analyzed countries displays a different optimal level. As supported by the theoretical literature, past history and frequency of social change (encouraged by economic growth and innovation in production) have an impact on the democracy maximizing level of equality. Although not all countries follow the inverted U-shaped correlation for the entire period, we have provided arguments in our case studies that the U-shaped correlation still holds as long as no fundamental transformation takes place, which significantly alters either the political or economic system.

Some countries, however, exhibit a Gini coefficient far above the democracy maximizing value. This leads to and will reinforce the negative trends of democratization in these countries. Strong wealth and income dispersion inhibits a broad individual exertion of political influence by affecting not only inclusiveness and supremacy, but also pluralism of public media and quality of elections. The effect on legislation allows instating redistributive policies and laws favoring the politically powerful, leading to further erosions of democratic governance and the disappearance of equal opportunities. This indicates bidirectional causation for those countries. Consistent with this logic, our data indicates causation in both directions. Yet although inequality is significant for democratization, democratization is no a significant determinant in our model for equality. Furthermore, the former arguments suggest a cyclic causation for countries with high levels of equality. As citizens feel less the need to support their political opinion and exhibit low interests in politics,

interest groups and political elites can affect policymaking in their favor, thereby increasing wealth and income inequality.⁵ A detailed analysis of these dynamics is left to future research. In addition, our paper suggests that there exists an impact of GDP and human capital on the democracy maximizing level of equality and the potential of democratization, which should be studied in greater depth in future work.

The paper has direct policy implications. Inequality is an essential driver of social change, thus low but significant levels encourage a perpetual democratization process. This implies that policy makers will face a trade-off between improving components leading to more democracy and increasing inter-group equality at low Gini levels. However, the implications for countries exhibiting high discrepancies in income are explicit: too high levels of inequality seriously discourage and even harm democratization. Consequently, the data of developed countries provide an ambiguous basis for explicit policy recommendations. UK labor market reforms have significantly increased income inequalities and decreased democracy levels on the short-run, but have improved the latter in the long-run. Similar reforms in Germany under Schroeder have both increased levels of democracy and inequality, yet recently democracy levels are falling. Norway, a country known for its high degree of democracy has maintained its high levels since the mid-1970s, but has experienced cyclic shifts in its Gini coefficient, with peaks in the mid-1970s and 2000s.

The implications for former second world or developing countries are however more straightforward. Countries of the former Eastern bloc, such as the Czech Republic and Hungary, which underwent a tremendous economic and political transition find themselves at the ascending part of the inverted U-shaped correlation, and only time will tell when these countries pass the peak of democratization. In these countries, economic reforms go hand in hand with democratic reforms at the cost of an increased income inequality. On the other hand, developing countries, such as Mexico and Chile have experienced increasing levels of democracy and a simultaneous decrease in inequality (for Mexico since the 1970s, and for Chile since the 1990s). In these countries, income equality and democracy are positively correlated. Democratic reforms limit income inequalities, while redistributive policies increase the UDS by easing political participation and by bringing into line political and economic power.

⁵ A regression on the basis of a polynomial of higher degree for the German data provides some support for this interpretation. Yet, data is too sparse for any statistical significant inference.

1. References

- [1] Acemoglu, Daron and James Robinson (2000). “Why Did the West Extend the Franchise? Democracy, Inequality, and Growth in Historical Perspective”. *Quarterly Journal of Economics*, 115(4), pp. 1167-1199.
- [2] Acemoglu, Daron and James A. Robinson (2001). “A Theory of Political Transitions”, *American Economic Review* 91, pp. 938-963.
- [3] Acemoglu, Daron and James A. Robinson (2006) *Economic Origins of Dictatorship and Democracy*, New York: Cambridge University Press.
- [4] Acemoglu, Daron; Suresh Naidu; Pascual Restrepo and James A. Robinson (2015). “Democracy, Redistribution, and Inequality.” in *Handbook of Income Distribution*, Edited by Anthony B. Atkinson and Francois Bourguignon, Volume 2, pp. 1885-1966.
- [5] Alemán, José and Yang, David D. (2011). “A Duration Analysis of Democratic Transitions and Authoritarian Backslides”. *Comparative Political Studies*, 20(10), pp. 1–29.
- [6] Arellano, M .; Bond , S ., (1991), “Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations”, *Review of Economic Studies*, Vol. 58, pp. 277-297.
- [7] Arellano, M., Bover, O., (1995), “Another look at the instrumental-variable estimation of error-components Models”, *Journal of Econometrics*, Vol. 68, pp. 29-52.
- [8] Barro, R., Lee, J., (2012), “A new data set of educational attainment in the world, 1950–2010”, *Journal of development economics*, Vol. 104, pp. 184-198.
- [9] Blundell, R, Bond, S., (1998), “Initial conditions and moment restrictions in dynamic panel data models”, *Journal of econometrics*, Vol. 87(1), pp. 115-143.
- [10] Boix, Carles. (2003). *Democracy and Redistribution*. New York: Cambridge University Press.
- [11] Campbell, David E. (2006). *Why We Vote: How Schools and Communities Shape Our Civic Life*. Princeton, N.J.: Princeton University Press.
- [12] Crouch, Colin (2004). *Post-democracy*. Cambridge. Polity Press.
- [13] Dahl, Robert A. (2013). *A Preface to Democratic Theory, Expanded Edition – 50th Anniversary Edition*. Chicago and London: The University of Chicago Press
- [14] Durkheim, Emile (1951). *Suicide. A Study in Sociology*. Glencoe, Illinois: Free Press.

- [15] Dumitrescu E. and Hurlin C. (2012), “Testing for Granger Non-causality in Heterogeneous Panels”, *Economic Modelling* 29, pp. 1450-1460.
- [16] Epstein David L., Robert Bates, Jack Goldstone, Ida Kristensen, and Sharyn OHalloran (2006). “Democratic Transitions”, *American Journal of Political Science* 50, pp. 55169.
- [17] Freeman, John R. and Quinn, Dennis P. (2012). “The Economic Origins of Democracy Reconsidered”. *American Political Science Review* 106(1), pp. 58-80.
- [18] Gradstein, Mark and Branko Milanovic (2004). “Does liberté = égalité ? A survey of the empirical links between democracy and inequality with some evidence on the transition economics”, *Journal of Economic Surveys* 18(4) , pp. 515-537.
- [19] Holtz-Eakin , D ., (1988), “Testing for individual effects in autoregressive models”, *Journal of Econometrics* 39, pp. 297-308.
- [20] Hsiao , C., (2003), *Analysis of Panel Data*, 2nd ed., Cambridge: Cambridge University Press.
- [21] Houle Christian (2009). “Inequality and Democracy: Why Inequality Harms Consolidation but Does Not Affect Democratization”, *World Politics* 61, pp. 589622.
- [22] Huntington, Samuel P. (1968). *Political Order in Changing Societies*, New Haven, Yale University Press.
- [23] Johnson, Chalmers (1966). *Revolutionary Change*. Boston, Little, Brown.
- [24] Krouse, Richard W. (1982). “Polyarchy & Participation: The Changing Democratic Theory of Robert Dahl”, *Polity* 14(3), pp. 441-463.
- [25] Lipset, Seymour Martin. [1960] 1981. *Political Man: The Social Bases of Politics*. Baltimore, Md.: Johns Hopkins University Press.
- [26] Marx Karl (1935). *The Class Struggles in France, 1848-1850* in Karl Marx and Frederick Engels, *Selected Works*, Foreign Languages Publishing House.
- [27] Meltzer, A. H. and S. F. Richard (1981). “A Rational Theory of the Size of Government”, *Journal of Political Economy*, 89(5) , pp. 914-927.
- [28] OECD (2011). “Growing Income Inequality in OECD Countries: What Drives it and How Can Policy Tackle it ?”. *OECD FORUM ON TACKLING INEQUALITY, PARIS, 2 MAY 2011, OECD*. Available at: <http://www.oecd.org/els/soc/47723414.pdf>

- [29] Oliver, J. Eric. (2001). *Democracy in Suburbia*. Princeton, N.J.: Princeton University Press.
- [30] Psacharopoulos, G., (1994), "Returns to investment in education: A global update, *World development*, Vol. 22 (9), pp. 1325-1343.
- [31] Pengl, Yannick (2013). "Strong Theories, weak Evidence The Effect of Economic Inequality on Democratization". *Living Reviews in Democracy*. Center for Comparative and International Studies, ETH Zurich and University of Zurich.
- [32] Pemstein Daniel, Meserve Stephen and Meltan, James (2010). "Democratic Compromise: A Latent Variable Analysis of Ten Measures of Regime Type". *Political Analysis* 18(4), pp. 426-449.
- [33] Piketty, T. (2014), *Capital in the Twenty-First Century*, translated by Arthur Goldhammer, Belknap Press.
- [34] Reenock, Christopher, Bernhard, Michael (2007). "Regressive Socioeconomic Distribution and Democratic Survival". *International Studies Quarterly* 51, pp. 677-699
- [35] Solt, Frederick. (2008). "Economic Inequality and Democratic Political Engagement", *American Journal of Political Science* 52, pp. 48-60.
- [36] Solt, Frederick (2009). "Standardizing the World Income Inequality Database", *Social Science Quarterly*, 90(2), pp. 231-242. SWIID Version 4.1, December 2014.
- [37] Teorell, Jan (2010). *Determinants of Democratization: Explaining Regime Change in the World, 1972-2006*. Cambridge: Cambridge University Press
- [38] Weber Max (1922). *Wirtschaft und Gesellschaft*, area Verlag (2007)