Report of the article: Democracy Does Cause Growth by Daron Acemoglu et al.

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Contents

1 Introduction

Acemoglu et al. (2019) explores the relationship between democracy and economic growth, challenging the notion of a negative or null effect. It employs three estimation strategies: dynamic panel models, semiparametric treatment effects, and instrumental variables. Findings suggest democracy positively impacts GDP per capita, fostering growth through investment, reforms, education, healthcare, and social stability. The significance of democracy varies with levels of secondary schooling. This challenges conventional wisdom and offers insights for nuanced policy approaches.
The study constructs a yearly panel for 175 countries from 1960 to 2010 to examine the impact of democracy on economic growth. It uses a consolidated measure of democracy derived from sources like Freedom House and Polity IV databases. Additionally, it tracks democratic transitions and reversals for 184 countries, considering both permanent and transitory transitions to avoid endogeneity issues. This approach differs from Papaioannou and Siourounis (2008), who only considered permanent transitions, potentially biasing their index with information about the success of democracy. They classify countries into seven geographic regions and provide descriptive statistics (Table 1 1) showing that democracies tend to be wealthier and have better-educated populations.

2 First strategy

The initial method the author employed to estimate the impact of democracy on GDP, utilizing the previously described democracy index, involves the application of a dynamic linear panel model [6]. This approach enables to capture the complex dynamics of GDP. It has been seen as democratizations are, on average, preceded by a temporary dip in GDP (Image 1), thus failing to properly model the GDP dynamics will inevitably lead to biased estimates of democracy on GDP.

2.1 Assumptions

The paper introduces the **Sequential Exogeneity Assumption** (Assumption 1), which is a fundamental concept in linear dynamic panel models. This assumption posits that democracy and past GDP are independent of contemporaneous and future shocks to GDP, and that the error term ϵ_{ct} exhibits no serial correlation. From an economic standpoint, this assumption implies that countries transitioning to or from democracy do not follow a different GDP trend compared to others with similar GDP levels in recent years (reflected in lagged GDP) and similar long-term development levels (reflected in country fixed effects). In order for this assumption to be valid, a sufficient number of lags of GDP is required, both to eliminate the residual serial correlation in the error term and to remove the influence of the dip in GDP that precedes a democratization. This is a strong assumption, but it is not implausible. The confidence in the plausibility of assumption 1 is bolstered by the fact that, as we will see later in section 2.4, controlling for a variety of economic factors and potential sources of differential trends has very little impact on our estimates.
In addition, the paper assumes also that GDP and democracy follow **Stationary** processes, conditional on country and year fixed effects (Assumption 2). This assumption guarantees that the dynamic panel estimators used here are consistent and have well-behaved asymptotic distributions. The author carries out a number of tests to check stationarity and also verify the robustness of the main findings to unit root or to near–unit root levels of persistence in the GDP process [6]. Overall, these exercises either reject the presence of a unit root in GDP or give similar results to the model with the stationarity assumption, confirming that the results are not affected by the assumption imposed.

2.2 Estimated model

$$y_{ct} = \beta D_{ct} + (\sum_{i=1}^{p} \gamma_i \cdot y_{c(t-1)}) + \alpha_c + \delta_t + \epsilon_{ct} \quad (1)$$

The model includes country and year fixed effects represented by α_c and δ_t. The y_ct denote the log of GDP per capita in country c at time t and D_ct is the dichotomous measure of democracy in country c at time t. As we alredy said, using the lags of log GDP per capita, the model aim to capture the dynamics of GDP, trying to grasp the influence of various economic factors such as commodity prices, agricultural productivity, and technology, which impact both economic growth and democracy.

2.3 Results

The logical choice for analyzing long panels like the one in question is the **within estimator** [6]. This is primarily because, given the assumptions we've made, it exhibits a bias of order $\frac{1}{T}$. Given the substantial size of T in our context, this bias is expected to be very small. The author utilizes the within estimator method, incorporating different numbers of lags. The preferred specification of the model incorporates four lags of GDP per capita. This choice is motivated by the fact that, with fewer than four lags, the assumption of no serial correlation in the residuals is violated, indicating that such a sparse lag structure fails to capture the full dynamics of GDP per capita. However, utilizing eight lags leads to a joint significance test's p-value suggesting that these lags collectively do not significantly influence current GDP. The democracy variable coefficient is 0.787 (standard error 0.226), implying a long-run impact [6] of a 21.24% increase in GDP per capita (standard error 7.21%). Therefore, democratization correlates with a 1.787% rise in GDP per capita after one year. Even though the Nickell bias is very small in our setting, the paper tries to deal with it using

the GMM estimator developed by Arellano and Bond, that produce consistent estimates of the dynamic panel model for finite T. Consistent with the expectations, the GMM estimates are very similar to the preferred specification. The only notable difference is that the GMM estimates imply a slightly smaller persistence for the GDP process, which leads to smaller long-run impacts than our preferred specification. However, a limitation of the Arellano and Bond GMM estimator is its reliance on a substantial number of moment conditions, scaling approximately with the square of the number of time periods, denoted as T^2. Consequently, as T grows, it can lead to a scenario of "too many instruments", where there are more instruments than observations available. This imbalance induces statistical inefficiency, causing an asymptotic bias proportional to $\frac{1}{N}$. The "HHK estimator" is employed by the author as an alternative to address the "too many instrument" issue. This estimator is unbiased when both N and T are large, under the conditions that Assumption 1 holds and GDP is stationary; all assumptions that are valid. Once the model incorporates four or more lags, the outcomes yielded by the HHK estimator closely resemble those produced by either the within estimator or the GMM estimator.

2.4 Robustness

One may criticize that the author is not accounting for the many time-varying economic and political factors that influence democracy and GDP. He investigate if these factors influence the analysis in table 4 [2], where again he split it into 3 panels which are regarding the three type of estimator used: the within estimator, the Arellano and Bond estimator and the HHK estimator. New variables are considered (list and explanation in the appendix) and tested if they invalidate the result, in that case it would have demonstrated that ignoring these factors leads the model to produce outcomes divergent from reality. However in all the cases it is found that the results were very close to the baseline one, coming to the conclusion that these factors do not change significantly results.

3 Second strategy

In this section, the study explores an alternative strategy for estimating the effects of a transition to democracy on GDP by focusing on modeling the selection of countries into democracy without specifying a parametric process for GDP.
One of the main concerns for the previous approach is the heavy reliance on the linearity assumption, albeit it being similar to the most commonly used empirical models in the literature. In fact, linearity would impose that the magnitude of the effects of transitions to and from democracy are the same, and it would restrict the time pattern of the cumulative effects of democracy on GDP.
For countries that are democratizing, they identify the causal relationship between GDP growth and democracy as:

$$\beta^s = \mathbb{E}[\Delta y^s_{\text{ct}}(1) - \Delta y^s_{\text{ct}}(0) \mid D_{\text{ct}} = 0, D_{\text{ct}-1} = 1]$$

Where $y^s_{\text{ct}}(d)$ denotes the potential GDP level in logs at time $t + s$ for country c which is transitioning its political institutions either to a democracy or a non-democracy at time t. This is denoted by the value of d, which is in $(0, 1)$. Therefore $\Delta y_{\text{ct}}(d)$ is the change in log GDP per capita from time $t - 1$ to time $t + s$ for a country with a change in political regime.
The study highlights how the challenge that arises in estimating β^s is that democratizing countries may be affected differently in terms of potential outcomes from those that remain in a non-democracy.
The study highlights how the challenge that arises in estimating β^s is that democratizing countries may be affected differently in terms of potential outcomes from those that remain in a non-democracy. To overcome this challenge, they draw parallels to treatment effect literature, with democracy being the "treatment" and the change in GDP as the potential outcome. They propose the assumption of Selection on Observables, which, as the name suggests, allows them to model the selection into democracy (like the selection into a clinical trial for a treatment) only based on observable factors such as lagged GDP and time effects. In fact, this assumption states that the transition to democracy (D_{ct}) depends solely on observable variables, denoted as $y_{\text{ct}21}, y_{\text{ct}22}, y_{\text{ct}23}, y_{\text{ct}24}$ for all $y_{\text{ct}21}, \ldots, y_{\text{ct}24}$, and for all c, t, and $s \geq 0$.
From an economic point of view this assumption is similar to the Sequential Exogeneity assumption, but it differs in how it incorporates the dynamics of GDP and unobserved fixed country characteristics. In fact, it limits unobserved country heterogeneity to be common to all nondemocratic countries at a specific time and recent GDP per capita trend. This implies that omitted characteristics affecting both the likelihood of democratization and GDP growth are either captured by lagged GDP or are common to all nondemocratic countries at a given time, ensuring that democratizing countries are not on a different trend compared to other nondemocratic countries with similar recent GDP levels.

3.1 Estimation using Selection on Observables

The study outlines three alternative methods for estimating the effects of democracy on GDP, based on different statistical approaches. These methods include linear regression adjustment, inverse-propensity-score re-weighting, and a doubly robust estimator. The results from these methods suggest that transitions to democracy have a positive impact on GDP, with estimates showing a gradual increase in GDP after democratization, plateauing at around 20-25 years later. These estimates are consistent across the different estimation approaches and are similar to the findings from the dynamic linear panel model presented earlier in the study.

Furthermore, the study discusses the effects of reversals from democracy to nondemocracy on GDP and provides estimates for these effects. Additionally, case studies of Portugal and South Korea are examined to illustrate how democratization influences subsequent economic growth.

4 Third Strategy

In this strategy the paper tries to solve the problem of possible omitted variables confounding for democracy and GDP growth. As we know from theory this is one of the sources of endogeneity, that can be solved by an instrumental variable approach. Furthermore, the IV solution alleviates the issues raised by measurement errors in their level of democracy, which could be another source of endogeneity that IV can attenuate.
In order to apply an IV approach they need an instrumental variable which satisfies the following conditions: exclusion, exogeneity, and relevance. The chosen variable is regional democratization waves, which refer to simultaneous or sequential waves of democratization occurring across multiple countries within a specific geographic region. This is justified as a good instrument since it allows for reasonable justifications for the assumptions to hold. In fact, its relevance is backed up by empirical evidence (see appendix [6]), the exogeneity is hypothesized based on the fact that "the most reasonable hypothesis - for the generation of such waves - is that regional pattern reflects the diffusion of the demand for democracy across countries within a region" leading to an exogeneity from GDP per capita. For the exclusion assumption instead, they state that it is "the main threat to the IV approach", not having any paper that provides evidence that the regional democratization wave has no effect on the GDP per capita of country c at time t. This being their insecurity, the researchers, estimate parameters both with and without controlling for a range of other economic and political factors that may also spread across countries in the same region (We will see this approach in Section 4.3).

4.1 Formalization

The formalization of the regional democratization waves is given by the definition of the instrument as the following equation

$$Z_{ct} = \frac{1}{I_\varepsilon} \sum_{C' \in I_c} D_{c't}$$

With D_{c,t_0} denoting whether a country c was a democracy or not at time t_0, and $I_c = \{c' : c' \neq c, R_{c'} = R_c, D_{c't_0} = D_{ct_0}\}$, where R_c denotes the geographic region in which the country lies (using the seven regions in defined previously). After constructing the instrumental variable, the subsequent step involves building the Two-Stage Least Squares (2SLS) model by specifying and estimating the first and second stage equations:

$$y_{ct} = \beta D_{ct} + \sum_{j=1}^{p} \gamma_j y_{ct-j} + \alpha_c + \delta_t + \epsilon_{ct}$$

$$D_{ct} = \sum_{j=1}^{q} \pi_j Z_{ct-j} + \sum_{j=1}^{p} \phi_j y_{ct-j} + \theta_c + \eta_t + v_{ct}$$

This is identical to the dynamic panel model above, but they treat democracy as endogenous and instrument it by using the lags of Z_ct. Still including the lags of GDP to control for the dip in the GDP that precedes the democratization.

4.2 Results

First stage (panel B of Table 4): F-statistic is sizable for the excluded instruments, then the regional waves of democracies have strong influence in the likelihood of democracy for countries in the region. 2SLS (panel A of Table 4): With one lagged variable (Column 1) of the instrument the democracy coefficient is slightly larger than the one with dynamic strategy and long run effect of democratization is 26.32%. With four lags (4 preferred, as defined in the first strategies) the coefficient of democracy is even larger, with higher percentage impact on long term GDP of 31.52 percent (column 2). Why this change? Could be present a downward bias introduced by time-varying unobservable or the possibility of an attenuation in their previous estimates due to measurement error in the index of democracy. The inclusion of several lags of Z_{ct} as instruments further allows the authors to perform a Hansen-type overidentification test [6], which provides no evidence of misspecification, we can see in fact that the corresponding p-values are higher than any standard significance level, then the hypothesis of the test is not rejected.

4.3 Robustness

As indicated before, to assess the uncertainty of the exclusion assumption the economists include time-varying covariates that could invalidate the restriction. If the results do not change, the assumptions can be considered reasonable, while if they change with the covariates, then it would suggest that these covariates may be correlated with both the instruments and the outcome variable, violating the exclusion restriction. The authors therefore choose a range of variables to include (list in appendix) that most likely could be correlated with the transitions to democracy and GDP (potentially confounding factors), examining the similarities with the previous results. All the results (Table 4) appear to be very similar to the initial ones, taking evidence of robustness of the model.

4.4 Test for regional correlation

In addressing the concern of regionally correlated omitted factors, the researchers modeled the spatial correlation of GDP and GDP shocks. Column 8 of Table 4 considered GDP spatial correlation based on country distance, while column 9 extended this to include spatial correlation of GDP shocks. This approach was motivated by the possibility of geographically linked GDP shocks and regional dependencies in democratization waves. Analysis from Panel B of Table 6 revealed that including spatially correlated GDP and democracy from other countries did not significantly change the relationship between regional democratization waves and country-level transitions to democracy. However, the 2SLS estimate showed a slight decrease in precision, indicating the challenge of separately estimating spatial GDP correlation and the impact of regional democratization waves.

4.5 HKK estimates

HHK estimates are built in the same way of the first strategy but using lags of $Z_c t$ as external instruments for democracy. The estimator is consistent for finite T under assumption 3, which is reasonable to assume based on the previous estimations. The results are broadly similar to IV estimates, suggesting robustness of findings.

5 Mechanisms

The authors, once convinced by the three methods that democracy is actually related positively the GDP per capita, they interrogates themselves on the causes of that relationship, trying to reach hypothesis that could explain a causal relationship between democracy and economic growth. This is done by estimating linear models that explore the relationship between target indicators that could correlate with higher economic stability (list in appendix) with its lags, the GDP (+lags) and the Democracy index. In this way they could assess the relationship between Democracy and the indicator, controlling for the GDP effect. Besides controlling for the dip in GDP that precedes a democratization, the lags of GDP on the right-hand side of equation help remove the mechanical effect of greater GDP on some of these inter mediating variables. They estimate models of the form:

$$m_t = \beta D_t + \sum_{j=1}^{\rho} \gamma_j d_{t-j} + \sum_{j=1}^{\rho} m_{t-j} + \alpha x_t + \delta_t + \epsilon_t$$

where the notation is the same as the other strategies and the new variable m_{ct} is the investigated variable of country c at time t. The results (in Table 5) of this relationship investigation are that the estimated models indicate that democracy tends to be related to an increase economic reforms, tax revenue, and school enrolment; and to a decrease in child mortality rates and social unrest. It is also shown less precise effects on investment and trade openness and no significant impact on total factor productivity (TFP). All these results can be seen in Table 5, where we can see signs and magnitude of coefficients for the democracy index variable in relationship with the variables using different strategies of estimation. These findings suggest that democracy may promote growth by enacting reforms, investing in education and healthcare, and maintaining social stability. However, while these variables could be outcomes of economic growth, their consistent increase post-democratization implies they are likely channels through which democracy affects growth.

6 Conclusion

We can say that the authors conduct an unusual way of investigating the objective of the research. In each strategy they construct a model based on strong assumptions (i.e. sequential exogeneity and exclusion of the IV) and consistently reach similar results, proving their robustness. Taken individually, the assumptions could be considered as too far fetched, but collectively they convey clearly that democracy has a positive effect on future GDP per capita. To give a numeric measure of this influence we see that (our preferred specifications) imply that long run GDP increases by 20 to 25 % in the years after a democratization. We see also that democratization take place in regional waves.
The authors tailor the study to account for each unjustified assumption. Even a difficulty such as the validity of exclusion assumption of the IV approach has been dealt with exhaustive attention. Even though the validity of the exclusion assumption (in the IV approach) has been tested with a solid methodology as explained above, it is still quite a strong assumption to be made. For this reason, to bolster the validity of this assumption even further, additional covariates could be accounted for when considering democratization waves as the instrumental variable. For example, one could account for the faster spread of information and of ideas that could affect GDP growth. This could be associated with a more democratized area, since, as the paper points out, democracy seems to be heavily correlated with personal freedom policies such as freedom of speech and worker rights.
A possible limitation of the paper could be a limited explanations of economic intuition behind the mechanisms from which democracy acts on GDP. The arguments could've included some more qualitative analysis, also looking at more variables that change after a democratization (i.e. investments in technology and development, or research, quality of education) or even incorporate survey of people in countries after democratization, to actually match the data with on-site observations. These are just possible ways to further develop this work. As we said before, the quantitative study is exhaustive and well posed.

List of Graphs and Tables

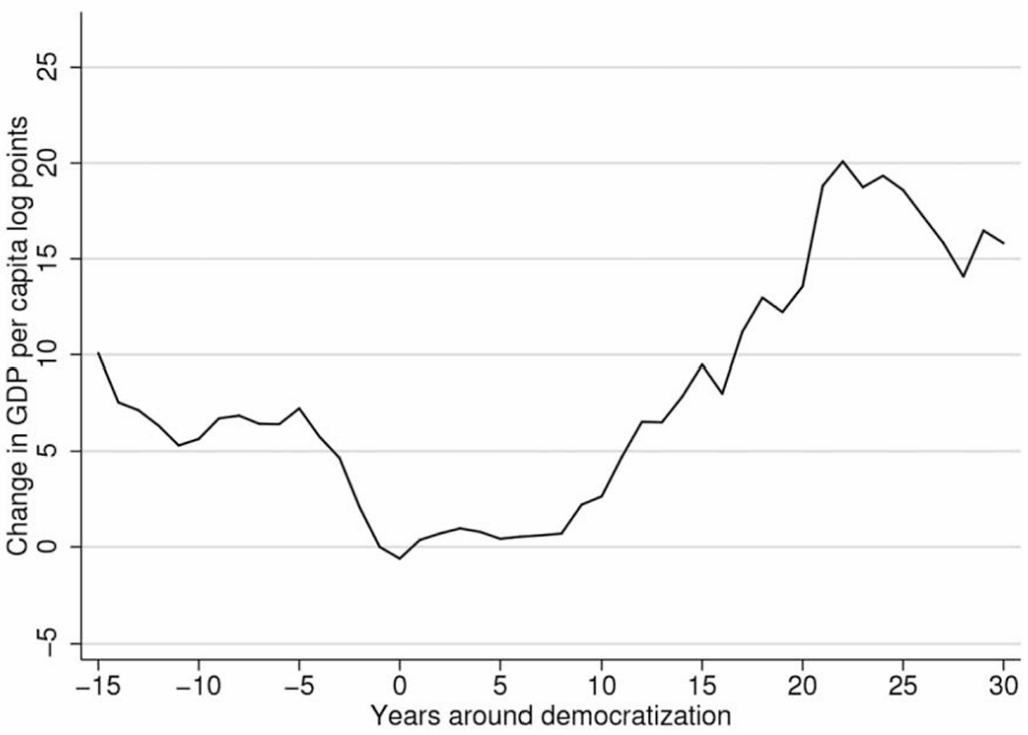

Figure 1: Dip in GDP

TABLE 4
EFFECT OF DEMOCRACY ON (LOG) GDP PER CAPITA, CONTROLLING FOR COVARIATES

	Covariates Included							
	(1)	GDP in 1960 Quintiles × Year Effects (2)	Soviet Dummies (3)	Lags of Unrest (4)	Lags of Trade (5)	Lags of Financial Flows (6)	Lags of Demographic Structure (7)	Region × Regime × Year Effects (8)
	A. Within Estimates							
Democracy	.787	.718	.911	.705	.595	.926	.650	.834
	(.226)	(.249)	(.251)	(.224)	(.264)	(.244)	(.230)	(.264)
Long-run effect of democracy	21.240	22.173	24.860	17.000	14.593	23.870	14.153	16.651
	(7.215)	(8.702)	(7.783)	(5.980)	(7.122)	(8.211)	(5.419)	(5.546)
Effect of democracy after 25 years	16.895	16.261	19.587	13.567	11.500	18.149	12.251	14.532
	(5.297)	(5.982)	(5.724)	(4.644)	(5.336)	(5.435)	(4.552)	(4.726)
Persistence of GDP process	.963	.968	.963	.959	.959	.961	.954	.950
	(.005)	(.005)	(.005)	(.004)	(.006)	(.006)	(.005)	(.005)
Observations	6,336	5,523	6,336	5,643	5,750	4,950	6,262	6,336
Countries in sample	175	149	175	171	172	171	172	175
	B. Arellano and Bond Estimates							
Democracy	.875	.730	1.073	.693	1.034	1.017	.756	1.217
	(.374)	(.387)	(.403)	(.396)	(.469)	(.373)	(.370)	(.420)
Long-run effect of democracy	16.448	14.865	20.006	9.871	17.926	18.607	12.152	18.209
	(8.436)	(8.998)	(8.981)	(6.479)	(9.021)	(7.842)	(6.639)	(6.746)
Effect of democracy after 25 years	14.713	12.759	17.874	9.159	15.659	15.903	11.334	16.861
	(7.128)	(7.350)	(7.564)	(5.768)	(7.593)	(6.327)	(6.004)	(6.050)
Persistence of GDP process	.947	.951	.946	.930	.942	.945	.938	.933
	(.009)	(.008)	(.009)	(.012)	(.009)	(.007)	(.010)	(.010)
AR2 test p-value	.51	.90	.28	.62	.72	.34	.58	.70
Observations	6,161	5,374	6,161	5,467	5,570	4,779	6,090	6,161
Countries in sample	175	149	175	171	172	171	172	175
	C. HHK Estimates							
Democracy	1.178	.722	1.059	1.203	1.110	2.030	1.262	1.482
	(.370)	(.357)	(.364)	(.376)	(.332)	(.359)	(.355)	(.449)
Long-run effect of democracy	25.032	15.731	21.648	25.557	24.575	32.631	22.161	26.358
	(10.581)	(8.476)	(9.431)	(9.842)	(9.031)	(7.727)	(6.641)	(9.178)
Effect of democracy after 25 years	20.853	12.719	18.313	20.753	19.407	28.896	19.633	22.776
	(7.731)	(6.503)	(7.162)	(7.072)	(6.359)	(6.223)	(5.647)	(7.380)
Persistence of GDP process	.953	.954	.951	.953	.955	.938	.943	.944
	(.009)	(.006)	(.009)	(.008)	(.008)	(.008)	(.006)	(.008)
Observations	6,161	5,374	6,161	5,467	5,570	4,779	6,090	6,161
Countries in sample	175	149	175	171	172	171	172	175

NOTE.—This table presents estimates of the effect of democracy on log GDP per capita. The reported coefficient of democracy is multiplied by 100. Panel A presents results from the within estimator. Panel B presents results from Arellano and Bond's GMM (1991) estimator. The AR2 row reports the p-value for a test of serial correlation in the residuals of the GDP series. Panel C presents results using the HHK (Hahn et al. 2001) estimator. In all specifications we control for a full set of country and year fixed effects and four lags of GDP per capita. In addition, we control for the covariates specified in each column label and described in the text. Standard errors robust against heteroskedasticity and serial correlation at the country level are reported in parentheses.

Figure 2: First Strategy, robustness

TABLE 5
SEMIPARAMETRIC ESTIMATES OF THE EFFECT OF DEMOCRATIZATIONS ON (LOG) GDP PER CAPITA

	Average Effects from						
	−5 to −1 Years (1)	0–4 Years (2)	5–9 Years (3)	10–14 Years (4)	15–19 Years (5)	20–24 Years (6)	25–29 Years (7)
	A. Linear Regression Adjustment						
Avg. effect on log GDP	.060	2.454	3.621	7.806	14.037	24.075	21.310
	(.156)	(1.382)	(2.792)	(4.416)	(5.384)	(8.262)	(9.643)
	B. Inverse-Propensity-Score Reweighting						
Avg. effect on log GDP	−1.586	3.724	3.214	6.818	13.542	24.111	22.184
	(1.478)	(1.789)	(3.327)	(4.848)	(5.892)	(9.035)	(11.561)
	C. Doubly Robust Estimator						
Avg. effect on log GDP	.051	2.795	2.969	6.966	12.947	23.691	21.793
	(.151)	(1.471)	(3.067)	(4.359)	(4.881)	(7.638)	(9.566)

NOTE.—This table presents semiparametric estimates of the effect of a democratization on log GDP per capita over different time horizons, indicated in the column labels. We report estimates of the average (avg.) effect on the treated. Panel A presents estimates using regression adjustment to compute counterfactual outcomes for treated countries. Panel B presents estimates obtained via inverse-propensity-score reweighting. Panel C presents estimates obtained with a doubly robust estimator, combining the regression adjustment and the inverse-propensity-score reweighting. Below each estimate we report robust standard errors obtained via bootstrapping.

Figure 3: Second Strategy results

IV Estimates of the Effect of Democracy on (Log) GDP per Capita

			Covariates Included						
	(1)	(2)	GDP in 1960 Quintiles × Year Effects (3)	Soviet Dummies (4)	Regional Trends (5)	Regional GDP and Trade (6)	Regional Unrest GDP and Trade (7)	Spatial Lag of GDP (8)	Spatial Lags of GDP and Democracy (9)
				A. 2SLS Estimates with Fixed Effects					
Democracy	.966	1.149	1.125	1.292	1.697	1.817	1.107	1.335	1.361
	(.558)	(.554)	(.689)	(.651)	(.885)	(.663)	(.656)	(.536)	(.895)
Long-run effect of democracy	26.315	31.521	35.226	35.723	36.788	41.544	25.016	37.482	38.439
	(17.075)	(17.425)	(23.846)	(19.997)	(20.657)	(17.157)	(16.002)	(17.836)	(27.883)
Effect of democracy after 25 years	20.836	24.866	25.618	27.929	32.051	35.350	21.386	29.217	29.011
	(12.862)	(12.978)	(16.538)	(14.944)	(17.703)	(14.017)	(13.342)	(12.894)	(19.692)
Persistence of GDP process	.963	.964	.968	.964	.954	.956	.956	.964	.965
	(.005)	(.005)	(.005)	(.005)	(.006)	(.006)	(.006)	(.005)	(.006)
Hansen *p*-value		.21	.18	.32	.28	.25	.09	.04	.19
Observations	6,312	6,309	5,496	6,309	6,309	6,309	6,309	6,181	6,009
Countries in sample	174	174	148	174	174	174	174	173	173
Excl.-instruments *F*-statistic	119.1	33.2	16.8	26.7	23.7	13.6	16.7	17.5	4.6
				B. First-Stage Estimates					
Democracy wave $t-1$	.800	.547	.503	.480	.498	.522	.508	.540	.586
	(.073)	(.101)	(.130)	(.099)	(.092)	(.104)	(.102)	(.103)	(.101)
Democracy wave $t-2$		.133	.109	.133	.129	.117	.115	.136	.128
		(.081)	(.094)	(.080)	(.081)	(.079)	(.078)	(.078)	(.088)
Democracy wave $t-3$		.227	.270	.223	.228	.221	.223	.224	.282
		(.067)	(.077)	(.065)	(.070)	(.069)	(.070)	(.070)	(.077)
Democracy wave $t-4$		−.087	−.119	−.075	−.123	−.083	−.064	−.072	−.107
		(.110)	(.126)	(.110)	(.106)	(.113)	(.113)	(.113)	(.116)
				C. HHK Estimates					
Democracy	.690	.944	1.435	.719	.822	1.311	.897	1.021	1.206
	(.642)	(.479)	(.599)	(.503)	(.480)	(.435)	(.371)	(.549)	(.485)
Long-run effect of democracy	14.512	24.766	46.767	18.337	16.413	24.040	17.290	29.286	31.111
	(14.703)	(14.083)	(22.556)	(13.688)	(10.700)	(9.989)	(8.556)	(18.354)	(15.167)
Effect of democracy after 25 years	11.768	18.670	31.039	13.969	13.778	21.100	14.668	21.133	23.702
	(11.445)	(9.799)	(13.113)	(9.935)	(8.523)	(8.038)	(6.734)	(11.942)	(10.243)
Persistence of GDP process	.952	.962	.969	.961	.950	.945	.948	.965	.961
	(.011)	(.008)	(.008)	(.009)	(.010)	(.010)	(.010)	(.009)	(.008)
Observations	6,161	6,161	5,374	6,161	6,161	6,161	6,161	6,132	5,960
Countries in sample	174	174	148	174	174	174	174	173	173

Note.—This table presents IV estimates of the effect of democracy on log GDP per capita. The reported coefficient of democracy is multiplied by 100. Panel A presents 2SLS estimates instrumenting democracy with up to four lags of regional democracy waves and the *p*-value of a Hansen overidentification test. Panel B presents the corresponding first-stage estimates and the excluded (excl.)-instruments *F* statistic. Panel C presents results using the HHK (Hahn et al. 2001) estimator instrumenting democracy with up to four lags of regional democracy waves (except for col. 1, where we use only one lag). In all specifications we control for a full set of country and year fixed effects and four lags of GDP per capita. In addition, we control for the covariates specified in each column label and described in the text. Standard errors robust against heteroskedasticity and serial correlation at the country level are in parentheses.

Figure 4: Third Strategy Results

EFFECTS OF DEMOCRACY ON POTENTIAL MECHANISMS

	DEPENDENT VARIABLE								
	Log of Investment Share in GDP (1)	Log of TFP (2)	Index of Economic Reforms (3)	Log of Trade Share in GDP (4)	Log of Tax Share in GDP (5)	Log of Primary-School Enrollment (6)	Log of Secondary-School Enrollment (7)	Log of Child Mortality (8)	Dummy for Unrest (9)
	A. Within Estimates								
Democracy	2.391	−.205	.687	.689	3.311	1.042	1.345	−.253	−7.832
	(1.114)	(.276)	(.348)	(.676)	(1.409)	(.338)	(.610)	(.063)	(2.185)
Long-run effect of democracy	9.112	−2.883	5.580	5.445	16.062	21.908	18.960	−34.264	−11.944
	(4.255)	(3.858)	(2.883)	(5.253)	(6.650)	(7.624)	(8.622)	(10.747)	(3.329)
Effect of democracy after 25 years	9.089	−2.738	5.359	5.303	15.864	18.892	18.057	−21.400	−11.944
	(4.245)	(3.648)	(2.753)	(5.126)	(6.574)	(6.321)	(8.146)	(5.124)	(3.329)
Persistence of outcome process	.738	.929	.877	.873	.794	.952	.929	.993	.344
	(.020)	(.012)	(.012)	(.011)	(.016)	(.008)	(.013)	(.001)	(.030)
Observations	5,665	3,879	4,692	5,738	4,511	3,714	2,883	6,084	5,646
Countries in sample	169	107	150	172	131	166	158	173	171
	B. 2SLS Estimates								
Democracy	2.211	−.941	3.224	5.512	8.088	1.757	4.116	−.715	−5.569
	(2.852)	(.667)	(.863)	(2.005)	(3.021)	(.721)	(1.626)	(.164)	(5.682)
Long-run effect of democracy	8.440	−12.738	23.775	40.589	38.609	36.693	57.072	−95.728	−8.471
	(10.705)	(8.854)	(6.215)	(13.580)	(14.330)	(15.505)	(21.698)	(26.347)	(8.577)
Effect of democracy after 25 years	8.419	−12.167	23.156	39.817	38.159	31.611	54.252	−58.625	−8.471
	(10.681)	(8.380)	(6.039)	(13.375)	(14.121)	(12.863)	(20.267)	(13.123)	(8.577)
Persistence of outcome process	.738	.926	.864	.864	.791	.952	.928	.993	.343
	(.020)	(.012)	(.012)	(.012)	(.017)	(.008)	(.013)	(.001)	(.030)
Excl.-instruments *F*-statistic	21.7	27.7	43.7	21.5	31.8	12.1	10.4	26.3	28.6
Hansen *p*-value	.29	.06	.22	.09	.69	.09	.12	.02	.84
Observations	5,640	3,871	4,670	5,714	4,489	3,710	2,879	6,057	5,619
Countries in sample	168	107	149	171	130	164	156	172	170

	DEPENDENT VARIABLE								
	Log of Investment Share in GDP (1)	Log of TFP (2)	Index of Economic Reforms (3)	Log of Trade Share in GDP (4)	Log of Tax Share in GDP (5)	Log of Primary-School Enrollment (6)	Log of Secondary-School Enrollment (7)	Log of Child Mortality (8)	Dummy for Unrest (9)
	C. HHK Estimates								
Democracy	6.603	.388	1.121	1.255	4.277	1.384	2.144	−.306	−3.638
	(1.336)	(.294)	(.371)	(.790)	(2.044)	(.366)	(.644)	(.068)	(2.931)
Long-run effect of democracy	25.495	7.518	22.655	10.182	24.622	41.349	43.070	−54.798	−5.742
	(5.313)	(6.011)	(11.199)	(6.584)	(11.858)	(14.855)	(15.445)	(15.745)	(4.630)
Effect of democracy after 25 years	25.432	6.748	15.698	9.807	23.966	29.049	36.865	−29.139	−5.742
	(5.294)	(5.366)	(5.953)	(6.307)	(11.461)	(8.614)	(11.888)	(6.131)	(4.630)
Persistence of outcome process	.741	.948	.951	.877	.826	.967	.950	.994	.366
	(.018)	(.009)	(.018)	(.014)	(.031)	(.007)	(.012)	(.001)	(.037)
Observations	5,125	3,557	4,236	4,866	4,045	3,579	2,683	5,454	5,233
Countries in sample	168	107	149	171	130	164	156	172	170

NOTE.—This table presents estimates of the effect of democracy on the different channels specified in the columns labels. The reported coefficient of democracy is multiplied by 100 (except for cols. 3 and 9). Panel A presents within estimates. Panel B presents 2SLS estimates instrumenting democracy with four lags of regional democracy waves, the *F*-statistic for the excluded (excl.) instruments, and the *p*-value of Hansen's overidentification test. Panel C presents results using the HHK (Hahn et al. 2001) estimator instrumenting democracy with four lags of regional democracy. In all specifications we control for a full set of country and year fixed effects, four lags of GDP per capita, and four lags of the dependent variable. Standard errors robust against heteroskedasticity and serial correlation at the country level are in parentheses.

Figure 5: Mechanisms Results

Appendix

Dynamic linear panel model

A dynamic linear panel model is a statistical framework used to analyze longitudinal data, where observations are collected over time for multiple entities. The "dynamic" aspect refers to the inclusion of lagged values of the dependent variables in the model, capturing the temporal dependence or persistence of the variables.

Unit root and near-unit root

A unit root exists in a time series when the series has a stochastic trend, meaning that it exhibits a systematic pattern of growth or decline over time. Time series data with a unit root are non-stationary, meaning that their statistical properties (such as mean and variance) change over time, making it difficult to identify consistent patterns or relationships. Near-unit root behavior refers to a situation where a time series variable is close to having a unit root but may not fully exhibit all the characteristics of a unit root.

Within estimator

The within estimator, also known as the fixed effects estimator or the within transformation, is a method used in panel data analysis to control for individual-specific effects or time-invariant heterogeneity.The within estimator tries to remove the individual-specific effects from the data, by subtracting individual-specific means or deviations from the observed data. In this way, it allows more accurate estimation of the relationships between variables.

The long-run impact

From the estimates we can derive the long-run effect of a permanent transition to democracy using the formula:

$$\frac{\hat{\beta}}{1 - \sum_{i=1}^{p} \hat{\gamma}_i}$$

Hansen-type overidentification test

The Hansen-type overidentification test is a statistical test used to assess the validity of instrumental variables in an instrumental variable regression model. It evaluates whether the instruments are uncorrelated with the error term in the regression equation. The null hypothesis (H_0) of the Hansen test is that the instruments are valid, meaning they are uncorrelated with the error term. The alternative hypothesis (H_1) is that the instruments are invalid, indicating they are correlated with the error term. In LaTeX, the formulas for H_0 and H_1 in the Hansen-type overidentification test can be represented as follows:

$$\text{Null hypothesis } (H_0) : \text{Instruments are valid} \quad \text{(Uncorrelated with error term)}$$

$$\text{Alternative hypothesis } (H_1) : \text{Instruments are invalid} \quad \text{(Correlated with error term)}$$

List of variables tested in Strategy one, robustness

The easiest bias to think of comes from the differential GDP trends among the countries that democratize. To test this, we compare the effect of democracy between countries that had similar levels of economic development. We see in column 2 (table 4) that these controls have little impact on the results. Another bias could be that the results in some countries are driven by the transition to democracy of Soviet and Soviet satellite countries. To verify this we introduced a dummy for these countries but again, as we see in column 3(table 4), these controls have little impact on the results. Democracy may also be driven by external economic shocks that also influence growth. To deal with this in column 5(table 4) we add four lags of trade exposure and in column 6(table 4) we control for lags of external financial flows. The table shows that the results are very similar to the baseline.

Empirical evidence of regional democratization waves

The instrumental variables used in the paper are regional waves (of democracy or opposition to democracy) which provides a source of exogenous variation in democracy level for a given country. It is argued by the authors in fact that there is multiple empirical evidence of this "regional influence", for instance the Arab Spring experience, Latin America and the Caribbean in the 1980s, Eastern Europe, Central Asia, and Africa in the 1990s, etc.. There is actually no certainty nor general consensus on how those waves are generated and what are their base factors, but the most reasonable hypothesis described by the paper is that the regional pattern reflects the demand for a change in the political landscape across countries with similar cultural, ethical and historical backgrounds, most often sharing the same political cultures, practical problems and informational ties (a lot of citations). This probable explanation allows the authors to use the waves as source of exogeneity for democracy's variation.

Variables used to assess the mechanism behind the relationship

TFP (in logs), the measure of economic reforms introduced by Giuliano et al. (2013; normalized between 0 and 100), the share of trade in GDP (in logs), the share of taxes in GDP (in logs), primary school enrollment, secondary school enrolment, child mortality rates (in logs), and the social-unrest dummy introduced above.

Variables used to probe robustness under exclusion assumption

GDP quantiles of 1960 X Year dummies (for various years, including 1989, 1990, 1991, and post-1992), Soviet dummies, regional trends, regional GDP and Trade, Regional Unrest GDP and Trade.