On the Distribution of Education and Democracy*

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Abstract

This paper empirically analyzes the influence of the distribution of education on democracy by controlling for unobservable heterogeneity and by taking into account the persistency of some of the variables. The most novel finding is that increase in the education attained by the majority of the population is what matters for the implementation and sustainability of democracy, rather than the average years of schooling. We show this result is robust to issues pertaining omitted variables, outliers, sample selection, or a narrow definition of the variables used to measure democracy.

JEL classification: O10, P16

Key words: Democracy, political economy, education inequality, dynamic panel data model

I   Introduction

A quick glance at the initial years of schooling and subsequent political regimes across-countries strongly support Lipset´s (1959) hypothesis that high educational standards are one of the basic conditions sustaining a democracy. For instance, all the countries with an average of at least 4 years of schooling in 1960 are nowadays stable democracies, whereas the countries with less that 1 year of education in 1960 remained authoritarian regimes during the period 1960-2000. This simple observation in favour of the so called modernization theory has been corroborated by thorough empirical evidence (e.g. Barro, 1999, and Glaeser et al., 2004).

However, recently Acemoglu et al. (2005) have challenged the Lipset´s hypothesis. These authors point out that previous cross-country estimations that find a positive correlation between education and democracy could be biased due to a problem of omitted variables. In fact, when they estimate a dynamic panel data model that controls for country specific effects and analyze the relationship between education and democracy within a country, the authors find no relationship between an increase in education and an increase in the level of democracy.[1]

In this paper we provide empirical support for Lipset´s views even taking into account unobservable heterogeneity. Mainly, we depart from the previous literature in two ways. Firstly, we state that it is the education attained by the majority of the society that should be relevant for the implementation and sustainability of democracies across and within a country. That is, in order to proxy for the education attained by the median voter it seems more appropriate to use a measure of the distribution of education rather than a measure of the average years of schooling. In fact, an increase in the average years of schooling could be driven by an increase in the education attained by a minority elite, which might not encourage a democratic regime. However, the previous empirical literature that has analyzed the effect of education on democracy has not taken into account distributional issues. In this paper we state that the distribution of education is relevant in the determination of a democratic regime. In fact, we find the empirical regularity that more than an increase in the average years of schooling, it is an increase in the education attained by the majority of the population that matters for democracy. In this line, some recent developments in the political economy literature have also introduced inequality as the new key dimension in the theoretical models (e.g. Acemoglu and Robinson (2000, 2001), Boix and Garicano (2002)). However, most of these models focus on the distribution of income and wealth while our approach is enterely related to the distribution of education.

Secondly, from a methodological point of view, we use the system GMM estimator, which has been proved to perform better than the first-difference estimator in Monte Carlo simulations when variables are highly persistent (see Blundell and Bond, 1998). As is well known, fixed effect and first difference GMM estimators, used by Acemoglu et al. (2005), exploit the within country variation in the data. Nevertheless, these techniques might not be appropriate when variables are highly persistent over time, as is the case of democracy and educational measures. For instance, 36 out of 104 countries in the sample display the same value in the political rights index in 1970 and in 2000, which implies that the variation in democracy during this period is null for these countries. In the case of education, the characteristic of persistency is also relevant. Table 1 shows that more than 85 per cent of the variation in education is cross-sectional, whereas the explanatory power of time dummies in a regression where the dependent variable is the average years of schooling is less than 1 per cent. Therefore, an econometric technique that exploits the bulk of the variation in the data would be preferable in order to improve the precision of the estimated coefficients. By adding the original equation in levels to a system of equations that also includes equations in first

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[1]Even though Glaeser et al. (2004) also find a positive effect of increments in schooling on increments in democracy and other political institutions, Acemoglu et al. (2005) show that this result is driven by the omission of time effects in the regressions.

differences, the system GMM estimator is particularly useful in our context since, in addition to controlling for country-specific effects, it preserves the cross-country dimension of the data that is lost when only the first differenced equation is estimated.

[Insert Table 1]

For a sample of 104 countries during the period 1960-2000, our results imply that rather than an increase in the average years of education, what really matters for democracy is an improvement in the education attained by the majority of the society. This finding is in line with Lipset´s view, who states that "*education presumably broadens men´s outlooks, enables them to understand the need for norms of tolerance, restrains them from adhering to extremist and monistic doctrines, and increases their capacity to make rational electoral choices.* (1959, p. 79)" Therefore, if formal education provides political attitudes conducive to democracy, the likelihood of a country establishing and maintaining a democratic regime will be higher the larger the educated population in the society.

We show the results are robust to an array of sensitivity tests. Firstly, we analyze the relationship between education and democracy in different samples that include developing as well as advanced economies and in a sample that excludes oil exporting countries. Secondly, we control for a broad number of variables that have been found in the literature to be relevant for democracies (e.g. Barro, 1999). Thirdly, we control for time invariant variables that proxy for earlier institutions (see Acemoglu et al., 2001 and 2004). Fourthly, we complement the analysis by using the measures of democracy and institutions suggested by Glaeser et al. (2004) and alternative measures of education inequality computed by Castelló and Doménech (2002). Finally, we check the robustness of the results to the presence of atypical observations. In all exercises we find that an increase in the amount of education attained by the majority of the population stimulates democracy.

The rest of the article is organized as follows. The next section describes the data and the econometric technique used. Section III presents the main result of the paper which states a positive relationship between a more equal distribution of education and the level of democracy. Section IV examines the robustness of this result. Finally, the last section summarizes the conclusions reached.

II   Model and Data

II. I   The Econometric Model

As proposed by Acemolgu et al. (2005), this paper analyzes the relationship between education and democracy by estimating the following dynamic model:

$$Democracy_{i,t} = \beta Democracy_{i,t-\tau} + \gamma Education_{i,t-\tau} + \alpha_i + \xi_t + \varepsilon_{i,t} \qquad (1)$$

where i is the country, t is the period and τ is the time lag. The variable *Democracy* lagged τ periods enters the set of explanatory variables to capture the characteristic of persistency in democracies. The coefficient of interest is γ, which reflects whether *Education* has any effect on democracies. The measure of education will include the level of education as well as its distribution. We also control for time, ξ_t, and country specific effects, α_i. Therefore, the advantage of estimating a panel model is that we can control for unobservable variables that are country specific and whose omission-e.g. in a pure cross-sectional regression- may bias the estimated coefficients.

The most common approach to estimate a dynamic panel data model has been the first difference Generalized Method of Moments (GMM) estimator proposed by Arellano and Bond (1991). The idea of this estimator is to take first differences to eliminate the source of inconsistency, that is α_i, and use the levels of the explanatory variables lagged two and further periods as instruments. In order for the first difference GMM estimator to be consistent we need to assume that the errors are not second order serially correlated and that the explanatory variables are weakly exogenous. If these assumptions hold we can use the following moment conditions:

$$E[(\varepsilon_{i,t} - \varepsilon_{i,t-\tau})W_{i,t-s\tau}] = 0 \text{ with s} \geq 2 \tag{2}$$

where $W = [Democracy\ Education]$. However, although the first difference GMM estimator deals properly with the problem of unobservable heterogeneity, it has some shortcomings in the estimation of equation (1). The first has to be with the characteristic of persistency of the variables included in this equation. These variables, particularly educational measures, vary significantly across countries but remain quite stable within a country. Thus, by taking first differences most of the variation in the data, which comes from variability across countries, disappears. This fact may indeed increase the measurement error bias by increasing the variance of the measurement error relative to the variance of the true signal (Griliches and Hausman, 1986). Moreover, Blundell and Bond (1998) point out that when explanatory variables are persistent, the lagged levels of the explanatory variables are weak instruments for the variables in differences. They show that in small samples the shortcomings of weak instruments translate into a large finite sample bias.

We can partially solve these problems by estimating a system of equations that includes equations in differences as well as equations in levels. By including a regression in levels the system GMM estimator, proposed by Arellano and Bover (1995) and Blundell and Bond (1998), incorporates the cross-country variation of our data. In the system GMM estimator the equations in first differences eliminate the fixed effect in the model. Moreover, the difference equations are combined with equations in levels, which are instrumented with the lagged first differences of the corresponding explanatory variables. In order to use these additional instruments, we need the identifying assumption that the first differences of the explanatory variables are not correlated with the specific effect, that is, although the specific effect may be correlated to the explanatory variables, the correlation is supposed to be constant over time. Therefore, the additional moment conditions for the equation in levels are:

$$E[\Delta W_{i,t-\tau}(\alpha_i + \varepsilon_{i,t})] = 0 \tag{3}$$

If the moment conditions are valid, Blundell and Bond (1998) show that in Monte Carlo simulations the system GMM estimator performs better than the first difference GMM estimator. We can test the validity of the moment conditions by using the conventional test of overidentifying restrictions proposed by Sargan (1958) and Hansen (1982) and by testing the null hypothesis that the error term is not second order serially correlated. Furthermore, we test the validity of the additional moment conditions associated with the level equation with the difference Hansen test.

II. II   The Data

The most common measure of *democracy* used in the literature is the Freedom House Political Rights Index. The Freedom House measures freedom through the political rights and the civil liberties indexes. These variables range from 1 to 7, indicating more freedom the closer the value is to 1. These measures are available for several countries from 1972 to 2003. In line with Barro (1999) and Acemoglu et al. (2005) we complement these measures with the related variables from Bollen (1990) for the years 1960 and 1965 and normalize the variables to range from 0 to 1, where the greater the value the more democratic a set of institutions is.[2]

The measures of *education* include the average years of education of the population 25 years and over from Barro and Lee (2001). The human capital Gini coefficient and the distribution of educations by quintiles is computed by Castelló and Domémech (2002). The time span is a five-year panel from 1960 to 2000.

III   Education and Democracy

Table 2 presents the results of the estimation of equation (1) under different assumptions regarding the error term. In all equations we measure education with the average years of education in the population 25 years and over (*Average Educ*) and with a measure of equality in the distribution of education, which calculates the percentage of education attained by sixty per cent of the population (3rd *Quintile Educ*). The measure of democracy in all equations is the political rights index.

Column (1) shows the results in the existing literature that do not control for country specific effects, that is, the estimated equation assumes that $\alpha_i = 0$. In line with the previous findings, results show that the correlation between the average years of schooling and the measure of democracy is positive and statistically significant, suggesting that more education is related to more democracy. We obtain similar results if we check the modernization theory by measuring education with the third quintile (column (2)). Furthermore, we can calculate the "steady state" effect as $\gamma/(1-\beta)$, to compute the long run effect, if causal, from education to democracy. The estimated values of the parameter imply that an increase in one standard deviation in the years

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[2]We use the data from the Freedom House in 1972 for the year 1970.

of education (about 2.9 years) would increase the long run value of democracy by 0.22. In the case of the third quintile the magnitude of the effect is quite similar to the average effect; a one standard deviation increase in the third quintile (0.19) is estimated to increase the long term value of democracy by 0.22 ((0.352/(1-0.698)*0.19)). The results, however, differ when both variables are included in the set of controls. In that case, the estimated coefficient and significance of the average years of education decreases substantially, while the quantitative effect of the third quintile on democracy remains sizeable.

In line with the results of Acemoglu et al. (2005), column (4) shows that the positive association between education and democracy disappears once we control for country specific-effects ($\alpha_i \neq 0$). In view of these results, Acemoglu et al. (2005) conclude that *"this strongly suggests that the cross-sectional relationship between education and democracy is driven by omitted factors influencing both education and democracy rather than a causal relationship* (p. 48)".[3]

Nevertheless, as stressed above, the characteristic of persistency in the explanatory variables may cause several biases in the first difference GMM estimator. The first is the potential measurement error bias since first differences may increase the variance of the noise to the true signal ratio. The second is related to the problem of weak instruments, biasing the first difference GMM estimator towards the fixed effect counterpart.[4] Hence, in order to address these shortcomings we can use an alternative estimator that reduces the potential biases and imprecision associated with the first difference estimator. In fact, when we control for country specific effects and take into account the cross-country variation in the data the results are akin to those obtained by Barro (1999), Glaeser et al. (2004, 2005) and Papaioannou and Siourounis (2005), who provide evidence of a positive impact of education on democracy. As shown in columns (7-8), the coefficient of the average years of education is positive and statistically significant at the 1% level, and the same is true for the distribution of education. However, when both measures are included in the regression (column (9)), while the coefficient of the average years of education drops markedly and is no longer statistically significant, the coefficient of equality in the distribution of education changes only slightly.

The reliability of the results depend on the validity of the instruments. We report the diagnostic tests at the bottom of the table. The p-values of the AR (2) test give the probability of correctly rejecting the null hypothesis of no second order serial correlation. The Hansen J test validates the adequacy of the instruments, the failure to reject the null hypothesis of the validity of the instruments indicates that the specification is correct. The Difference Hansen test evaluates the validity of the additional orthogonality condition in the system GMM. As displayed at the bottom of Table 2, the values of the diagnostic tests suggest that the instruments are valid.

In sum, this preliminary evidence directs our attention to the education attained by the majority

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[3]The fixed effect estimator, which also removes the cross-country variation in the data, displays similar results (not shown). However, this estimator is only consistent under the assumption of strict exogeneity, which does not hold in a dynamic panel data model since $E[Democracy_{i,t-\tau} \ \varepsilon_{i,t-\tau} \neq 0]$.

[4]Bobba and Coviello (2006) also highlights the problem of weak instruments and weak identification in Acemoglu´s et al. (2005) results.

of the society as the relevant educational variable that stimulates democracy.[5]

[Insert Table 2]

IV   Robustness of the Results

The evidence found in the previous section reveals two novel findings. The first shows that even when controlling for fixed omitted variables, more education is related to a greater degree of democracy. The second leads to the suggestion that a more equal distribution of education is the relevant educational variable determining democracy. In this section we study the robustness of the aforementioned results.

IV. I   Different samples

Table 3 displays the results when we estimate equation (1) for different samples. In the first place, we analyze whether or not the relationship between education and democracy depends on the level of development (columns (1)-(6)). The results show that in developing countries as well as advanced economies the educational variable that seems to be relevant for democracy is the education attained by the majority of the society. However, the positive association between a better distribution of education and democracy is stronger in developing countries with an estimated coefficient of 0.521 compared to 0.153 in developed societies.

Secondly, in the last three columns we exclude oil exporting countries since the impact of development on democracy in these economies may be through a channel other than the accumulation of human and physical capital.[6] In fact, in most of these countries the level of education is quite low and the degree of inequality in the distribution of education is quite high. Moreover, considering

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[5] We have also checked the long run effect of education on democracy across countries. The reason is that William R. Hauk and Romain Wacziarg (2004) analyze the bias properties of different estimators in Monte Carlo simulations for growth regressions. Their findings suggest that the estimator that performs best when measurement error and country speciffic effects are accounted for is the OLS estimator applied to a cross-section with variables averaged over the period (between estimator). The results with the variables averaged over the period 1970-2000 is as follows:

$$Democracy_{i,1970-2000} \quad = \quad 0.165 + 0.461 \ Democracy_{i,1970} + 0.005 \ H_{i,1970-2000} + 0.653 \ 3^{rd} Q \operatorname{intile} H_{i,1970-2000}$$
$$(0.03) \quad (0.05) \qquad\qquad (0.01) \qquad\qquad (0.19)$$

where Nob=100, R^2=0.812 and the standard errors are shown in parenthesis.

In line with the preceding results, the variable that seems to be relevant for the degree of democracy is the education attained by 60 per cent of the population. Moreover, the quantitative effect of the distribution of education on democracy with the between estimator is even greater than that found with the system-GMM. The result holds if we control for per capita income and for regional dummies and if we measure the average years of education (H) and the percentage of education attained by sixty per cent of the population ($3^{rd} Quintile H$) at the begining of the period to reduce endogeneity problems.

[6] Oil exporters include Algeria, Cameroon, Congo, Mexico, Trinidad and Tobago, Ecuador, Venezuela, Bahrain, Indonesia, Iran, Iraq and Kuwait.

that many oil exporting countries have not become democracies, these countries could possibly be influencing our results. In columns (7-9) we eliminate the oil exporting countries from the sample. The results suggest that our previous findings were not driven by the specific characteristics of these economies; the estimated coefficient of the third quintile is always positive and statistically significant.

[Insert Table 3]

IV. II   Omitted variables

Next we check the robustness of the results to different controls. This exercise is important because if other variables that affect democracy and are related to education are omitted in the analysis, the estimated coefficient of the education variables could be biased. Therefore, we should control for additional explanatory variables that could be potential determinants of democracy.

In Table 3 we control for a broad range of potential determinants of democracy that have been suggested by the existing literature. The additional controls are added one at a time and enter the equation lagged one period. To save space we only show the estimated coefficients of the third quintile.[7] Democracy is measured through the political rights index and we also check the robustness of the results using the civil liberties index. The additional controls include the log of per capita income since income is the other important variable-apart from education- suggested by the modernization hypothesis to be highly related to democracy; the log of the investment share of GDP; the urbanization rate since the European democratization process in the eighteenth and nineteenth century has been argued to be influenced by the industrial revolution and the subsequent urbanization; a measure of the country size such as the level of population; two health indicators measured through the log of life expectancy at birth and the infant mortality rate as additional proxies for the standards of living; the gap between male and female schooling measured through the average years of primary education for the population aged 25 years and over, as suggested by Barro (1999); a measure of ethnolinguistic fractionalization since more heterogeneity in the population may be a handicap to sustain a democracy and the percentage of Muslims in the society given that previous researchers have found a negative correlation between Muslim countries and democracy.[8]

The results suggest that controlling for any of these potential determinants of democracies does not change the main result of the paper. In all cases, the coefficient of the third quintile in the distribution of education remains positive and statistically significant, which confirms that the

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[7] When we include both, average and distribution of education, the estimated coefficient of the average years of schooling is never statistically significant.

[8] The source of these variables is the PWT 6.1 by Heston, Summers and Aten (2002) for the log of per capita income, the log of the investment rate and the level of population. The urbanization rate, ethnic fractionalization and the infant mortality rate are taken from the Global Development Growth Data Base compiled by Easterly and Sewadeh (2002). Life expectancy source is the World Development Indicators 2004 and the percentage of Muslims in the total population is taken from La Porta et al. (1999).

results of the previous section are not due to the omission of relevant variables related to education and democracy.

Acemoglu et al. (2005) have suggested that the country-fixed effects could be capturing omitted factors that have influenced the joint evolution of economic and political development. In fact, Acemoglu et al. (2004) find that the country fixed-effects, estimated from the relationship between income and democracy, are highly related to historical variables that characterized earlier institutions. If these variables are driving the positive influence of the education attained by the majority of the society on democracy, we should find that once we control for these variables the positive effect vanishes. The lower part of Table 4 displays the results when historical and endowment variables, which are time invariant, are controlled for. Given that the time invariant variables enter as proxies of α_i, we can estimate equation (1) by OLS. In the first place, we include the log of settler mortality as the first time invariant variable since Acemoglu et al. (2001) use mortality faced by Europeans colonizers as a proxy for early institutions.[9] Moreover, geography and endowments have also been argued to influence the type of colonization and therefore the previous institutions. To check the robustness of our results to the effect of geography and endowments on democracy, we include latitude from the equator and oil exporting countries in the set of explanatory variables. Finally, we control for the quality of the legal system since, according to La Porta et al. (1998), it is related to the legal origin. In particular, these authors find that the common-law system is better at protecting property rights. The results show that controlling for historical or endowment variables, which have been suggested to be related to unobservable omitted fixed effects, does not change our result. The estimated coefficient of the third quintile is always statistically significant at the 1 per cent level and its value ranges from 0.303 to 0.391. Moreover, it is worth noting that the estimated value with the system GMM , displayed in column (9), ranges within this interval (0.350).[10] Therefore, the results suggest that our main finding is not driven by omitted variables that could have influenced both the political and economic development of societies.

[Insert Table 4]

IV. III   Alternative measures of democracy and education inequality

In the last table we check the robustness of the results to alternative measures of democracy and different indicators of the distribution of education. With regard to the measures of democracy, Table 5 displays the results with the additional measures of institutions and democracy used by Glaeser *et al.* (2004). The broader set of alternative measures of political institutions include

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[9] The interesting idea of Acemoglu et al. (2001) is that in places where Europeans faced high mortality rates, the settlers implemented extractive states that transferred resources rapidly to the metropolis. This strategy resulted in bad institutions that did not introduce protection of private property. On the contrary, when settlers faced low risk of mortality, they stayed in the colony and established European institutions that enforced the rule of law. Furthermore, the authors find evidence that early institutions have persisted to the present.

[10] Other variables suggested by Acemoglu et al. (2005) as being highly related to the fixed effects in democracy regressions, such as the density of the indigenous population in 1500, display similar results. In this case the estimated coefficent for the third quintile is 0.380 and the standard error is 0.065.

democracy, *autocracy* and *constraints on the executive*, from Polity IV and the measure of *autocracy* from Przeworski et al. (2000). Both variables take values from 0 to 10, where higher values show a greater degree of democracy and autocracy respectively. The autocracy variable from Przeworski ranges from 0 to 2 where higher values indicate a higher level of autocracy. *Executive constraint* is a measure of the extent of institutionalized constraints on the decision making powers of chief executives. Its value ranges from 1 to 7, where the greater the value the higher the constraints on the executive.[11] Columns (1)-(4) show that the influence of the education attained by sixty per cent of the population on democracy holds when we use different variables that measure the degree of autocracy or democracy in societies. The only exception is when we measure institutions with the index of democracy from Polity IV. In this case, although the coefficient of the third quintile is positive, it is not statistically significant at the standard levels. However, with additional measures from Polity IV, such as the *Combined Polity Score* computed by subtracting the *Autocracy* score from the *Democracy* score, the coefficient of the third quintile remains statistically significant.

We also check the robustness of the results to alternative measures of equality in the distribution of education. The results suggest that the percentage of education attained by the lowest and middle quintiles is an important determinant of democracy, whereas the percentage of education attained by the elite is not related to the level of democracy. An aggregate measure of inequality such as the Gini coefficient is also negatively related to the degree of democracy (column (8)).

Taken together, these findings reveal that the main result of the paper is not due to a narrow definition of democracy or to an inadequate definition of equality in the distribution of education. The use of alternative measures of institutions and different measures of inequality show that the distribution of education is an outstanding determinant of democracy.

[Insert Table 5]

IV. IV Atypical observations

Finally, we check if the results are influenced by the presence of atypical observations. In order to control for outliers, firstly, we reestimate the regression in column (9) of Table 2 by removing one country at a time. Then, we remove the 5 countries with the highest average values of the third quintile and the 12 countries with a value of zero in the third quintile. Finally, we repeat the exercise by ruling out the countries whose residuals exceed more than three times the estimated standard error of the residuals. In all cases the coefficient of the third quintile is positive and statistically significant, suggesting that the results are unlikely to be driven by outliers.

We have also run a robust regression procedure of column (3) in Table 2, which gets the Cook´s D values and then drops any observation if its Cook´s D value is greater than 1. Although the results show a greater estimated coefficient for lag democracy and lower coefficients for both educational variables compared to those obtained in column 3, the only educational variable that has a statistically significant effect on democracy is the third quintile.

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[11]For a more comprehensive definition of variables see Marshall and Jaggers (2003) and Przeworski *et al.* (2000).

V   Conclusions

One of the empirical regularities in political economy, which refers to the positive association between education and democracy, has been challenged recently by the paper of Acemoglu *et al.* (2005). These authors point out that previous empirical evidence could suffer from potential omitted variable bias. As a result, when these authors control for country specific-effects, the positive association between education and several measures of democracy disappears.

The present paper advocates that the results of Acemoglu *et al.* (2005) could be due to the problems inherent to the econometric techniques they use. Although the fixed effects and first-difference GMM estimators solve the problem of unobservable heterogeneity, these estimators may not be appropriate in the estimation of a dynamic panel data model with persistent variables. The exacerbation of the measurement error bias and the problem of weak instruments could cast doubt over the validity of the results. Improvements in the econometric techniques to estimate a dynamic panel data model with persistent variables has been made by Arellano and Bover (1995) and Blundell and Bond (1998). In fact, when this more appropriate econometric technique is used, the results obtained in this paper are in line with the Lipset´s (1956) hypothesis, which states a positive association between education and democracy.

In addition, in this paper we go one step further and analyze the hypothesis that it is a more equal distribution of education that matters for democracy, that is, the implementation and sustainability of democracies needs the support of the majority of the society. According to this hypothesis we find that the percentage of education attained by sixty per cent of the population seems to be a very important determinant of democracies. We find the empirical regularity that a more equal distribution of education is strongly related to a higher level of democracy. This result holds not only in the long term across countries but also in the short term within a country, as suggested by the estimation of a dynamic panel data model that does control for country specific effects.

The quite robust effect of the distribution of education on democracy found in this paper suggests that future theoretical and empirical research should pay more attention to the education attained by the median voter as a potential determinant of the degree of democracy. In particular, the novelty of the results and the lack of formalization of the Lipset´s views breaks new grounds for further theoretical work.

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Table 1

Democracy and Education

	Adjusted R^2 from regressions on country and time dummies		
Dependent variable	Country dummies	Time dummies	Country and time dummies
Education	0.855	0.066	0.968
Democracy	0.654	0.014	0.685
Countries	104		
Observations	764		

Note: Pooled OLS estimation. *Democracy* is measured through the political rights index and *Education* is the average years of education of the population 25 years and over.

Table 2
Democracy and Education.

	Pooled OLS			First-Dif GMM			System GMM		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Democracy_{t-5}$	0.698^a	0.698^a	0.686^a	0.555^a	0.533^a	0.530^a	0.647^a	0.658^a	0.652^a
	(0.031)	(0.031)	(0.032)	(0.084)	(0.076)	(0.077)	(0.062)	(0.060)	(0.060)
$Average\ Educ_{t-5}$	0.023^a		0.009^b	-0.016		0.007	0.022^a		0.004
	(0.003)		(0.004)	(0.033)		(0.23)	(0.006)		(0.009)
$3^{rd}\ Quintile\ Educ_{t-5}$		0.352^a	0.251^a		0.005	0.048		0.469^a	0.350^a
		(0.050)	(0.072)		(0.252)	(0.188)		(0.142)	(0.132)
$Constant$	0.092^a	0.122^a	0.110^a				0.135^a	0.115^b	0.132^a
	(0.020)	(0.021)	(0.021)				(0.036)	(0.045)	(0.035)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.71	0.72	0.72						
Countries	104	104	104	102	102	102	104	104	104
Obs	764	764	764	659	659	659	764	764	764
Period	1960-2000	1960-2000	1960-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000
AR (2) test				[0.652]	[0.649]	[0.665]	[0.754]	[0.841]	[0.814]
Hansen J test				[0.091]	[0.354]	[0.185]	[0.102]	[0.034]	[0.190]
Difference Hansen							[0.371]	[0.004]	[0.382]

Note: Robust standard errors in parenthesis. a, b and c are 1, 5 and 10 per cent significance level respectively. *Democracy* is measured through the political rights index. *Education* includes the average years of schooling of the population 25 years and over and the percentage of education attained by the sixty per cent of the population. The instruments for columns (4)-(6) are the levels of the explanatory variables lagged two periods and further lags until a maximum of 5. In addition to these variables, the system-GMM also uses as instruments for the level equations the explanatory variables in first differences lagged one period.

Table 3
Democracy and Education: Different Samples.
System GMM estimator. Dependent Variable is Democracy

	Developing countries			Developed countries			Base Sample without Oil Countries		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Democracy_{t-5}$	0.602^a	0.591^a	0.585^a	0.600^a	0.614^a	0.605^a	0.619^a	0.640^a	0.634^a
	(0.060)	(0.068)	(0.066)	(0.105)	(0.081)	(0.099)	(0.070)	(0.068)	(0.068)
$Average\ Educ_{t-5}$	0.018^c		-0.011	0.011		0.005	0.022^a		0.001
	(0.010)		(0.013)	(0.010)		(0.008)	(0.006)		(0.009)
$3^{rd}\ Quintile\ Educ_{t-5}$		0.493^a	0.521^a		0.241^b	0.153^b		0.461^a	0.385^a
		(0.127)	(0.147)		(0.112)	(0.073)		(0.150)	(0.139)
$Constant$	0.177^a	0.152^a	0.196^a	0.296^a	0.273^a	0.279^a	0.165^a	0.137^a	0.158^a
	(0.044)	(0.043)	(0.048)	(0.047)	(0.049)	(0.052)	(0.036)	(0.048)	(0.037)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Countries	69	69	69	23	23	23	92	92	92
Obs	505	505	505	179	179	179	676	676	676
Period	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000
AR (2) test	[0.699]	[0.756]	[0.745]	[0.572]	[0.595]	[0.594]	[0.692]	[0.770]	[0.752]
Hansen J test	[0.335]	[0.303]	[0.970]	[1.000]	[1.000]	[1.000]	[0.067]	[0.063]	[0.367]
Difference Hansen	[0.533]	[0.109]	[1.000]	[0.991]	[1.000]	[1.000]	[0.082]	[0.319]	[0.609]

Note: Robust standard errors in parenthesis. a, b and c are 1, 5 and 10 per cent significance level respectively. *Democracy* is measured through the political rights index. *Education* includes the average years of schooling of the population 25 years and over and the percentage of education attained by the sixty per cent of the population. The instruments are the levels of the explanatory variables lagged two periods and all further lags until a maximum of 5 as well as the variables in first differences lagged one period.

Table 4
Democracy and Education: Additional Explanatory Variables

System GMM estimator. Dependent Variable is Democracy

Aditional controls	Electoral rights		Civil liberties	
	3rd Quintile $Educ_{t-5}$	AR (2) test Hansen, Diff Hansen	3rd Quintile $Educ_{t-5}$	AR (2) test Hansen, Diff Hansen
lny_{t-5}	0.342^b	[0.76]	0.220^b	[0.45]
	(0.159)	[0.26, 0.84]	(0.107)	[0.31, 0.82]
$lnsk_{t-5}$	0.625^a	[0.70]	0.461^a	[0.43]
	(0.126)	[0.23, 0.67]	(0.087)	[0.35, 0.46]
Urbanization $Rate_{t-5}$	0.397^a	[0.82]	0.288^a	[0.19]
	(0.123)	[0.16, 0.17]	(0.081)	[0.32, 0.50]
$Population_{t-5}$	0.308^b	[0.64]	0.325^a	[0.36]
	(0.123)	[0.27, 0.94]	(0.088)	[0.36, 0.63]
Life $Expectancy_{t-5}$	0.324^a	[0.73]	0.359^a	[0.16]
	(0.094)	[0.20, 0.32]	(0.064)	[0.23, 0.45]
Infant $Mortality_{t-5}$	0.455^a	[0.80]	0.352^a	[0.16]
	(0.129)	[0.14, 0.20]	(0.091)	[0.28, 0.78]
Education gap_{t-5}	0.274^a	[0.79]	0.168^b	[0.17]
	(0.095)	[0.26, 0.57]	(0.078)	[0.30, 0.52]
$Ethnolinguistic_{t-5}$	0.418^a	[0.75]	0.371^a	[0.38]
	(0.131)	[0.16]	(0.100)	[0.18]
$Muslims_{t-5}$	0.427^b	[0.83]	0.323^b	[0.18]
	(0.165)	[0.09]	(0.140)	[0.08]

Endowments and historical variables. OLS estimator. Dependent Variable is Democracy

	3rd Quintile $Educ_{t-5}$	Obsevations R^2	3rd Quintile $Educ_{t-5}$	Obsevations R^2
ln Settler Mortality	0.391^a	386	0.341^a	386
	(0.078)	[0.60]	(0.060)	[0.65]
Latitude	0.347^a	748	0.303^a	748
	(0.051)	[0.72]	(0.040)	[0.77]
Oil	0.347^a	764	0.306^a	764
	(0.050)	[0.72]	(0.039)	[0.77]
Common-law	0.352^a	764	0.308^a	764
	(0.050)	[0.72]	(0.038)	[0.77]

Note: Robust standard errors in parenthesis. a, b and c are 1, 5 and 10 per cent significance level respectively. *Democracy* is measured through the political rights and the civil liberties indixes. The estimated coefficients shown are those of the 3rd quintile in the distribution of education. The definition of the remaining controls is in the text.

Table 5

Democracy and Education

Alternative mesures of democracy and the distribution of education. System-GMM

| | Polity IV | | | Przeworski *et al.* | Electoral Rights | | | |
| | Democracy | Autocracy | Exe. Cons. | Autocracy | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Democracy_{t-5}$	0.803^a	0.668^a	0.676^a	0.364^a	0.632^a	0.602^a	0.686a	0.631^a
	(0.054)	(0.080)	(0.067)	(0.095)	(0.062)	(0.061)	(0.059)	(0.058)
$Average\ Educ_{t-5}$	0.021	0.156	0.001	-0.018	0.009	0.001	0.019c	-0.011
	(0.116)	(0.110)	(0.080)	(0.034)	(0.006)	(0.009)	(0.010)	(0.012)
$3^{rd}\ Quintile\ Educ_{t-5}$	2.089	-4.545^b	2.280^c	-1.272^a				
	(1.929)	(1.910)	(1.260)	(0.475)				
$1^{st}\ Quintile\ Educ_{t-5}$					1.102^a			
					(0.356)			
$2^{nd}\ Quintile\ Educ_{t-5}$						0.723^a		
						(0.242)		
$5^{th}\ Quintile\ Educ_{t-5}$							-0.108	
							(0.100)	
Gini $Educ_{t-5}$								-0.494^a
								(0.124)
$Constant$	0.593^c	0.921^c	1.072^a	0.868^a	0.174^a	0.185^a	0.176^c	0.535^a
	(0.343)	(0.492)	(0.291)	(0.157)	(0.039)	(0.040)	(0.094)	(0.122)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Countries	102	102	102	99	104	104	104	104
Obs	713	713	713	513	764	764	764	764
Period	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000	1965-2000
AR (2) test	[0.239]	[0.439]	[0.275]	[0.129]	[0.739]	[0.688]	[0.803]	[0.795]
Hansen J test	[0.260]	[0.162]	[0.189]	[0.262]	[0.272]	[0.268]	[0.162]	[0.152]
Difference Hansen	[0.183]	[0.693]	[0.094]	[0.362]	[0.582]	[0.414]	[0.284]	[0.041]

Note: Robust standard errors in parenthesis. a, b and c are 1, 5 and 10 per cent significance level respectively. The instruments are the levels of the explanatory variables lagged two periods and all further lags until a maximum of 5 as well as the variables in first differences lagged one period.