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Income and democracy: Evidence from nonlinear estimations

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ABSTRACT

We test the relation between income and democracy during the postwar period. We employ panel estimation methods that explicitly allow for the fact that the primary measures of democracy are censored with substantial mass at the boundaries. We find that the statistically significant positive income–democracy relationship is robust to the inclusion of country fixed effects.

1. Introduction

The income–democracy correlation is the cornerstone of the "modernization theory". The theory claims a causal relation: democratic regimes are created and consolidated in affluent societies (e.g. Lipset, 1959, Przeworski and Limongi, 1997 and Epstein et al., 2006). Higher incomes can reduce conflict and support redistributive policies (e.g. Benhabib and Rustichini, 1996, Benhabib and Przeworski, 2006). However, a well-known recent paper by Acemoglu et al. (AJRY) (2008) argues that the income–democracy correlation is spurious. Using a cross-country panel between 1960 and 2000, they demonstrate that the significance of income in predicting democracy is not robust to the inclusion of country fixed effects. They interpret these specific effects as historical institutional arrangements, which are causing both democracy and higher income in the long run.

This note reexamines the effect of income on democracy, concentrating on the continuous measures often used in the literature.[1] From Barro (1999) on, studies dealing with either Freedom House or Polity measures of democracy have been mostly using linear models in their estimations. AJRY (2008) employs a dynamic linear panel estimation using GMM methods to evaluate the determinants of changes in democracy measured by the same indices.

We confront here the issue that measures of democracy are ordinal, censored, and with substantial mass at the boundaries, violating the maintained assumptions under OLS and general linear models. We respond to this problem by interpreting democracy as a latent variable, as in Treier and Jackman (2008), and by using either a two-sided Tobit specification or the double-censoring specification of Alan et al. (2008).[2] Additionally, we employ the Wooldridge (2005) method, which generalizes the Chamberlain (1980) estimator and parameterizes the fixed effects as well as the initial conditions in a dynamic panel. We also introduce a continuous and one-side censored measure of democracy – the Vanhanen (2000) Index of Democratization –. For all the three measures, there exists a statistically significant contribution from income to democracy, even in the presence of country fixed effects.[3]

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[1] For binary measures of democracy, see Acemoglu et al. (2009) and Benhabib et al. (2011).

[2] See Epstein et al. (2006) for the use of a Tobit estimator with Polity 2 data. Also Barro (1999) suggests that the use of nonlinear estimation would improve his approach.

[3] There are also several recent works that recover the significance of income under linear specifications using alternative econometric techniques (see Bobba and Coviello, 2007, Treisman, 2011, Moral-Benito and Bartolucci, 2011, and Heid et al., 2012).

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2. Data and econometric methods

2.1. Data

We consider two measures of income. First, we use the PWT (7.0) data set, which has coverage for 189 countries, and whose times series extend farther for most countries than previous versions.[4] The Penn World Tables have not been exempt from criticism. These criticisms point to the substantial degree of variability across different versions of the Penn World Tables (e.g. Ponomareva and Katayama, 2010 and Johnson et al., forthcoming) and to misgivings about purchasing power parity adjustments (e.g. Bergeijk, 1998 and Johnson et al., forthcoming). We note however that our results using the PWT (7.0) data set are similar to the ones using the PWT 6.3 data set in Benhabib et al. (2011). We also get similar results using the Maddison data set of per Capita GDP for 202 countries, which has even greater coverage per country than the Penn World Tables, facilitating the estimation of within-country variations.

We study several continuous measures of democracy: First, we use the composite Polity2 (PI2) index, which measures the difference between the Polity IV Democracy and Autocracy indices. A notable feature of the PI2 index, which may be problematic for linear statistical inference, is the substantial share of observations at either extreme. Almost 1/5 of the observations are coded as full democracies. This leaves the distribution of this variable bimodal. Moreover, a majority of these full democracies are high income countries which remain full democracies throughout our sample.

We also use the Freedom House Political Rights Index (FH), which allocates higher scores to countries that are closer to a set of characteristics that would be associated with a functioning democracy. In the spirit of maximizing the availability of within-country data, we follow Barro (1999) and AJRY (2008) in augmenting the index with the Bollen (2001) data for 1950–1965. The FH data is also bimodal, either with or without the inclusion of the Bollen data, with a substantial share of the countries in the sample designated as full democracies. Additionally, we also use the Vanhanen's (2000) Index of Democratization, which is a composite measure of voter participation rates and the intensity of election contestation. Unlike the PI2 and FH measures, the Vanhanen Index is not censored on the right hand side, and so the data is better able to track and identify an existing income–democracy relationship. All indices are normalized to range between 0 and 1.

We also control for additional covariates typically used in the literature, such as education and the log of population. Education is measured as average total years of schooling in the population age 25 and over, and population is measured as country inhabitants over 25 years old. Data is from Barro and Lee (2010).

The sample includes all independent countries during the post-war, with observations taken every fifth year from 1960 to 2000.[5] We choose the period to allow for comparability with previous works. As some countries received independence during this period, our base sample is unbalanced.

2.2. Specification

Consider the following linear specification,

$$d_{it} = \alpha d_{it-1} + \beta \log Y_{it-1} + \delta_t + \theta_i + \gamma X_{it-1} + \varepsilon_{it} \quad (1)$$

where d_{it} and $\log Y_{it-1}$ are democracy and the log of GDP per capita for country i at period t respectively, δ_t and θ_i represent time and country fixed effects respectively, X_{it-1} are additional covariates such as education and population, and ε_{it} is a disturbance term, clustered by country. Estimation of this specification under ordinary least squares is not suitable for our democracy measures which are censored and which have a substantial share of their samples falling on the boundaries. To account for these nonlinearities, we estimate using a two-sided Tobit specification. However, even in a Tobit specification our estimates may be inconsistent because of the incidental parameter problem: fixed effects cannot be omitted through differencing. The estimation of fixed effects is inconsistent for a given length of within-country time series, and in turn can bias the other parameter estimates. Alan et al. (2008) provide moment conditions for a two-sided censored panel in the presence of fixed effects. We therefore also report the results of this approach using their estimator, termed "Two-sides" below.

Another source of concern is that our sample is a dynamic panel which includes lagged values of democracy. For the linear case, this problem can be treated with panel-GMM, but our nonlinear specification presents a more challenging problem, as taking the initial condition of the dependent variable as independent of unobserved heterogeneity may bias estimates in dynamic panels that are short in the time dimension. We therefore also follow Wooldridge (2005) in generalizing the Chamberlain (1980) approach by assuming that country fixed effects can be specified as a linear function of the mean sample value of the observable independent variables, the initial condition for the lagged dependent variables and country specific random effects. Akay (2009) indicates that this method can be used in unbalanced panels.

3. Results

Table 1 summarizes our results for the three measures of democracy. With country fixed effects excluded, we obtain positive and statistically significant coefficient estimates for lagged income values using linear OLS. This is true for all three democracy measure samples. However, with fixed effects included, these results disappear for PI2 and FH. We thus verify the result in the literature that under OLS, the significance of lagged income on democracy levels is not robust to the inclusion of country fixed effects. However, the OLS results with the Vanhanen measure differ from the other censored democracy measures: the significance of lagged income is robust to the inclusion of country fixed effects. This is because the Vanhanen measure is censored only on the left, and is better able to capture the variability of democracy among countries with high measures of democracy.

We next turn to nonlinear estimations. We find some discrepancies across democracy measures and data sets. For PI2, lagged income is statistically significant using both the PWT 7.0 and Maddison data sets, with point estimates relatively similar across different specifications. In the case of FH, income is not significant using PWT income data but is significant using the Maddison income data at a 5% confidence level for all estimations. Finally, our results using the Vanhanen index are robust, with confidence levels between 1% and 5% throughout.

In addition, our point estimates indicate that substantial movements in income can have notable implications for measured democracy levels. While such spurts are exceptional, they do occur. In our balanced panel of 88 emerging market economies for which we have complete income data between 1960 and 2000, 18 countries, or 20.5% of the panel, experienced a growth spurt where income doubled within a 20 year period. To interpret the impact of such a growth spurt, consider that the mean coefficient for lagged income in all our specifications is 0.07. As lagged democracy is 0.5, the long run effect of income is 0.14. This effect implies that doubling income would result in an increase in measured democracy

[4] AJRY 2008 use the PWT 6.1 data set, which includes 168 countries.

[5] Five year periods are used to mitigate serial correlation problems; results are robust for averages. Our 1960 observation uses lagged data from 1955.