Reevaluating the modernization hypothesis

Citation: Acemoglu, Daron et al. "Reevaluating the modernization hypothesis." Journal of Monetary Economics 56.8 (2009): 1043-1058. © 2009 Elsevier B.V.

As Published: http://dx.doi.org/doi:10.1016/j.jmoneco.2009.10.002

Publisher: Elsevier

Persistent URL: http://hdl.handle.net/1721.1/55290

Version: Author's final manuscript: final author's manuscript post peer review, without publisher's formatting or copy editing

Reevaluating the Modernization Hypothesis

Daron Acemoglu[a], James A. Robinson[b], Simon Johnson[c], and Pierre Yared[d‡]

[a] MIT; [b] Harvard University; [c] MIT; [d] Columbia University

June 2009

Abstract

This paper revisits and critically reevaluates the widely accepted modernization hypothesis which claims that per capita income causes the creation and the consolidation of democracy. We argue that existing studies find support for this hypothesis because they fail to control for the presence of omitted variables. We show that controlling for these factors either by including country fixed effects in a linear model or by including parameterized random effects in a non-linear double hazard model removes the correlation between income and the likelihood of transitions to and from democratic regimes. In addition, we relate the estimated fixed effects from the linear model to historical factors that affect both the level of income per capita and the likelihood of democracy in a country. We argue that this evidence is consistent with the idea that events during critical historical junctures can lead to divergent political-economic development paths, some leading to prosperity and democracy, others to relative poverty and non-democracy.

Keywords: Democracy, Economic Growth, Institutions, Political Development.

JEL classification: P16, O10

*Corresponding author: pyared@columbia.edu

†We are grateful for the comments and suggestions of José Antionio Cheibub, Jorge Dominguez, Peter Hall, and Susan Stokes.

1. Introduction

According to Seymour Martin Lipset's (1959) *modernization hypothesis*, the level of economic development drives the creation and consolidation of democracy. This contrasts with another approach in political economy which we refer to as the *critical junctures hypothesis*. According to this hypothesis, institutional change which affects both economic and political development is initiated by differences during a certain critical historical juncture.[1]

The modernization hypothesis has been much more influential than the critical junctures hypothesis in social sciences.[2] In this paper, we demonstrate that the evidence supporting the modernization hypothesis is much weaker than the previous work has found. Instead, we present evidence consistent with the existence and importance of critical junctures.

Most previous work on the determinants of democracy uses cross-sectional regression analysis to investigate the causal relationship between income and democracy (in particular, democratic transitions). However, it is important to control for common variables affecting income and democracy. The simplest way of accomplishing this is to investigate the relationship between income and democracy in a panel of countries and to control for country fixed effects. Controlling for fixed effects is not only a simple and transparent strategy, but is also in the spirit of the critical junctures hypothesis, since it takes out the effect of constant, potentially historical, factors.

We show in this paper that once fixed effects are introduced into standard regressions of democracy, the positive relationship between income per capita and both the level of, and more importantly transitions to and from, democracy disappears.[3] More specifically, we find that high levels of income per capita do not promote transitions to democracy from

[1] This hypothesis is exemplified by Barrington Moore's famous (1966) thesis that the reasons why Britain moved gradually to democracy, Germany to fascism, and Russia to communist revolution are to be found in the differential organization of agriculture and the differential intensities of feudal legacies. Other studies which share a similar methodological approach include Engerman and Sokoloff (1997) and Acemoglu, Johnson, and Robinson (2001,2002), among others.

[2] Also see, among others, Londregan and Poole (1996), Przeworski and Limongi (1997), Barro (1999), Przeworski, Alvarez, Cheibub, and Limongi (2000), and Papaioannou and Siourounis (2006).

[3] For similar results focusing on the relationship between income and the *level* of democracy, see Acemoglu, Johnson, Robinson, and Yared (2008).

non-democracy, nor do they forestall transitions to non-democracy from democracy. Our findings are robust across different measures of democracy, the use of additional covariates, econometric specifications and estimation techniques. They hold not only in the most-commonly used sample period of 1960-2000; we show that they also hold for a balanced sample during the period 1875-2000.

In addition to linear specifications, we develop and implement a double hazard model for the simultaneous estimation of transitions to democracy and transitions away from democracy. Though the study of transitions to and away from democracy is of important interest, the econometrics of transition models is not entirely straightforward. Specifically, one cannot look at transitions to democracy or away from democracy as separate events because whether or not an observation is in the at-risk sample is endogenously determined ("selected"). We develop a simple framework to deal with this selection issue in the presence of fixed effects. Using this approach, we show that income per capita conditional on the fixed effects does not predict either transitions to democracy or transitions away from democracy.

The finding that income per capita causes transitions to democracy and prevents transitions away from democracy comes only from the cross-sectional variation in the data. Figure 1-4 provide a simple diagrammatic illustration of this point.[4] Figures 1 and 2 focus on the sample of non-democracies in every five year interval between 1955 and 1990. We observe which non-democracies experience democratization five years later. In Figure 1, we group observations depending on whether log income per capita is above or below the average log income per capita in the world for the observation year, and we calculate the fraction of non-democracies in each group which experienced a democratic transition. This figure corresponds to regressions without controlling for fixed effects, and it is consistent with the idea that non-democracies with high income per capita are more likely to experience democratization than non-democracies with low income per capita. Figure 2, on the other hand, provides a visual representation of the patterns once we take out some of the time-invariant

[4] All figures use the Przeworski index of democracy which categorizes countries as being either a democracy or a non-democracy.

omitted variables. To do this, we group observations depending on whether log income per capita is above or below the average log income per capita for *that* country between 1955 and 1990.[5] In contrast to Figure 1, Figure 2 shows that non-democracies that are richer than usual are not more likely to experience democratization. Figures 3 and 4 are analogous to Figures 1 and 2 for the sample of democracies, and in these figures we calculate the fraction of democracies which experience coups. Like Figure 1, Figure 3 corresponds to regressions without controlling for fixed effects, and it is consistent with the idea that democracies with low income per capita are more likely to experience coups than democracies with high income per capita. Figure 4, on the other hand, shows that democracies that are poorer than usual are not more likely to experience coups. These figures therefore provide a preview of how the results are likely to change once we control for omitted variables affecting both income and democracy. This leads us to conclude that the empirical support for and the strong conclusions drawn from the modernization hypotheses need to be reevaluated.

But if income does not cause democracy, then what does? The fact that including fixed effects removes the correlation between income and democracy suggests that relatively time-invariant, possibly historical factors are at the root of both the relative prosperity and the relative democratic experience of some countries. In order to explore this possibility, we investigate whether the inclusion of historical variables in a pooled cross-sectional regression removes the statistically significant association between income and democracy.

We focus on the sample of former European colonies, since for this sample there is a specific theory of political and economic development related to divergent development paths, and there is also data related to the determinants of these different paths during the critical junctures facing these former colonies (e.g., Acemoglu, Johnson, and Robinson, 2001, 2002). The available evidence suggests that the institutional differences created at the critical juncture of European colonization persisted and significantly contributed to the large differences in both the form of government and the economic success of these societies. Motivated by

[5] Both of these values are demeaned from the world average to account for time trends.

this evidence and reasoning, we add the following historical variables to the pooled cross-sectional regression: the indigenous population density before colonization, the constraint on the executive at (or shortly after) independence, and the date of independence. Indigenous population density before colonization proxies for the initial conditions affecting the colonization strategy and the subsequent development path (Acemoglu, Johnson, and Robinson, 2001, 2002); constraint on the executive at independence is the closest variable we have to a direct measure of relevant institutions during the colonial period; and date of independence is another measure of colonization strategy, since non-extractive colonies gained their independence typically earlier than the extractive ones. Consistent with the critical junctures hypothesis, we find that the inclusion of these three variables significantly diminishes and makes insignificant the cross-sectional correlation between income and democracy. This confirms that the fixed effects are systematically related to historical variables associated with political and economic divergence in history, and this lends support to the critical junctures hypothesis.

Our work is most closely related to Acemoglu, Johnson, Robinson, and Yared (2008) who also investigate the relationship between income and democracy.[6] Whereas this work focuses on the effect of income on the *level* of democracy, the current paper focuses on the effect of income on *transitions* to and from democracy using a linear model as well as a double hazard model which accomodates fixed effects. Moreover, the current paper considers and provides support for the critical junctures hypothesis as an alternative to the modernization hypothesis by linking the magnitude of the fixed effects to historical variables.

The paper proceeds as follows. In Section 2., we discuss the data used. In Section 3., we show that the introduction of fixed effects removes the statistical association between the level of income and the level of democracy. In Section 4., we show that the introduction of fixed effects in a linear model and in a non-linear double hazard model removes the statistical association between income and transitions towards and away from democracy. In Section

[6] Acemoglu, Johnson, Robinson, and Yared (2008) also provide a more comprehensive review of the literature on democratization, and we refer the reader to that paper to avoid repetition.

5., we confirm the robustness of our results in a longer sample beginning in 1875. In Section 6., we investigate our interpretation of the fixed effects regressions. Section 7. concludes.

2. Data and Descriptive Statistics

We follow the existing empirical research in the way we measure democracy. Our first measure of democracy is the Freedom House Political Rights Index. This index ranges from 1 to 7, with 7 representing the least amount of political freedom and 1 the most freedom.[7] Following Barro (1999), we supplement this index with the related variable from Bollen (1990, 2001) for 1950, 1955, 1960, and 1965. As in Barro (1999), we transform both indices so that they lie between 0 and 1, with 1 corresponding to the most democratic set of institutions.

The Freedom House index, even when augmented with Bollen's data, only enables us to look at the post-war era. The Polity IV dataset, on the other hand, provides information for all countries since independence starting in 1800. Both to look at pre-1940 events and as a check on our main measure, we also use the composite Polity index, which is the difference between the Polity's Democracy and Autocracy indices.[8] To facilitate comparison with the Freedom House score, we also normalize the composite Polity index to lie between 0 and 1.

Both of these measures enable us to distinguish between different shades of democracy. An alternative empirical approach has been defended and used by Przeworski et al. (2000) who argue that a simple dichotomy between democracy and non-democracy is the most useful empirical definition. Dichotomous measures may also be better suited to analyses of transitions from and to democracy. Therefore, we present results using the Boix-Rosato dataset which extends the data of Przeworski et al. (2000) in which the index equals 1 if a country is a democracy and equals 0 otherwise. We also develop a simple double hazard model to deal with the simultaneous modeling of transitions to and from democracy. All of

[7] See Freedom House (2004), http://www.freedomhouse.org/research/freeworld/2003/methodology.htm

[8] The Polity Democracy Index ranges from 0 to 10 and is derived from coding the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive. The Polity Autocracy Index also ranges from 0 to 10 and is constructed in a similar way to the democracy score. See Marshall and Jaggers (2004) and http://www.cidcm.umd.edu/inscr/polity/

these exercises using the dichotomous measures give very similar results to those using the continuous measures. We construct five-yearly and annual panels. For the five-year panels, we take the observation every fifth year.[9]

In addition, we use GDP per capita data from the Summers-Heston dataset for the post-war period (Heston, Summers, and Atten, 2002), GDP per capita data from Maddison (2003) for the prewar and long samples, a measure of educational attainment from the Barro-Lee dataset (average years of schooling for people in the population over the age of 25), and total population from the World Bank (2002).

When we turn to the former European colonies sample, we obtain the date of independence from the CIA World Factbook and the constraint on the executive after independence from the Polity IV dataset.[10] Population density in 1500 is calculated by dividing the historical measures of population from McEvedy and Jones (1975) by the area of arable land (see Acemoglu, Johnson, and Robinson, 2002).[11]

3. Levels of Democracy

We begin by considering the effect of income on the *level* of democracy by estimating of the following simple linear regression model:

$$d_{it} = \alpha d_{it-1} + \gamma y_{it-1} + \mathbf{x}'_{it-1}\boldsymbol{\beta} + \mu_t + \delta_i + u_{it}, \tag{1}$$

[9] We prefer this procedure to averaging the five-yearly data, since averaging introduces additional serial correlation, making inference and estimation more difficult. For the Freedom House data which begins in 1972, we follow Barro (1999) and assign the 1972 score to 1970 for the purpose of the five-year regressions. Moreover, we assign the 1994 score in the Boix-Rosato data to 1995 for the purpose of the five-year regressions.

[10] The data on constraint on the executive from Polity begins in 1800 or at the date of independence. In our former colonies sample only one country, the United States became independent before 1800 and its date of independence is coded as 1800.

[11] Throughout the paper, we adopt the definition of former European colonies used in Acemoglu, Johnson, and Robinson (2001, 2002), which excludes the Middle Eastern countries that were briefly colonized by European powers during the 20th century. This definition is motivated by our interest in former colonies as a sample in which the process of institutional development, in particular during the 19th century and earlier, was shaped by European intervention (see Acemoglu, Johnson, and Robinson, 2002).

where d_{it} is the democracy score of country i in period t. The lagged value of this variable on the right hand side is included to capture persistence in democracy and also potentially mean-reverting dynamics. The main variable of interest is y_{it-1}, the lagged value of log income per capita. The parameter γ therefore measures the impact of income per capita on democracy. Other covariates are captured by the vector $\mathbf{x}'_{it-1}$ with coefficient vector $\boldsymbol{\beta}$. In addition, the μ_t's denote a full set of time effects, which capture common shocks to (common trends in) the democracy score of all countries.[12] Importantly, the equation also includes a full set of country dummies, the δ_i's. These country dummies capture any time-invariant country characteristics that affect the equilibrium level of democracy. v_{it} is an error term, capturing all other omitted factors, with $E(v_{it}) = 0$ for all i and t. The sample period is 1960-2000 and time periods correspond to five-year intervals.[13]

The most important benefit of the fixed effect estimator is that, as is well known, if the δ_i's are correlated with y_{it-1} or $\mathbf{x}_{it-1}$, then pooled OLS estimates–which are standard in the literature and exclude δ_i from (1)–are biased and inconsistent. In contrast, even if $cov(y_{it-1}, \delta_i + u_{it}) \neq 0$ (or $cov\left(x^j_{it-1}, \delta_i + u_{it}\right) \neq 0$ where x^j_{it-1} represents the j'th component of the vector $\mathbf{x}_{it-1}$) but $cov(y_{it-1}, u_{it}) = cov\left(x^j_{it-1}, u_{it}\right) = 0$ for all j, then the fixed effects estimator will be consistent. This structure of correlation is particularly relevant in this context, because the critical junctures hypothesis suggests precisely the presence of historical factors affecting both political and economic development.[14]

Column 1 presents pooled cross-sectional regressions of democracy on income which exclude country fixed effects which replicate previous results of the literature. All panels pool the time-series and cross-sectional variation. All standard errors in the paper are robust

[12] Throughout the paper, all specifications include a full set of time dummies, the μ_t's, since otherwise regression equations such as (1) capture world-wide trends.

[13] The fact that the democracy index takes discrete values induces a special type of heteroscedasticity, but creates no difficulty for inference with OLS, as long as standard errors are corrected for heteroskedasticity (e.g., Wooldridge, 2002, Section 15.2).

[14] Nevertheless, there should be no presumption that fixed effects regressions will necessarily estimate the causal effect of income on democracy, for example because there are time varying omitted variables. See Acemoglu, Johnson, Robinson, and Yared (2008) for instrumental variable strategies designed to estimate the causal effect of income on democracy.

against arbitrary heteroskedasticity in the variance-covariance matrix, and they allow for clustering at the country level.[15] Panel A of Table 1 uses the Freedom House data, panel B uses the Polity data, and panel C uses the dichotomous Przeworski index. Lagged democracy is highly significant and shows a considerable degree of persistence in democracy. Log GDP per capita is also significant and illustrates the well-documented positive relationship between income and democracy. Though highly statistically significant, the effect of income is quantitatively small. For example, the coefficient of 0.073 (standard error = 0.010) in column 1 of panel A implies that a temporary 10 percent increase in GDP per capita is associated with an increase in the Freedom House score of 0.0073, and a permanent increase in GDP per capita by 10 percent is associated with an increase in the (steady state) Freedom House score of only 0.0073/(1-.703)≈0.025 (for comparison, the gap between the United States and Colombia today is 0.5). Overall, column 1 in Table 1 confirms the main finding of the existing literature of a positive association between income and democracy.

While the earlier literature has typically interpreted this as the causal effect of income on democracy, column 2 which introduces country fixed effects shows that such an interpretation may not be warranted. In none of the panels is income per capita significant, and it typically has a very small coefficient. With the Freedom House data the coefficient in 0.008 (for example, compared to 0.073 in column 1 of Table 1) with a standard error of 0.034. With the Polity data in panel B, the estimate is basically zero, -0.003 (standard error=0.038).[16]

Note that there is an econometric problem involved in the estimation of (1) as we do in column 2. The regressor d_{it-1} is mechanically correlated with u_{is} for $s < t$, so the standard fixed effects estimation is not consistent (e.g., Wooldridge, 2002, chapter 11). However, it can be shown that the fixed effects OLS estimator becomes consistent as the number of time periods in the sample increases. In columns 3 and 4, we consider estimation strategies to

[15] Clustering is a simple strategy to correct the standard errors for potential correlation across observations both over time and within the same time period. See for example Moulton (1986) or Bertrand, Duflo, and Mullainathan (2004).

[16] We have also investigated whether the lack of a statistical association between income and democracy once we condition on fixed effects is driven by some outliers in the data, and found no major outliers.

deal with this issue, while in column 5, we use annual data which should reduce the extent of this bias considerably.

Our first strategy, adopted in column 3, is to use the Generalized Method-of-Moments Estimator (GMM) proposed by Arellano and Bond (1991). This builds on the approach first suggested by Anderson and Hsiao (1982) and uses second and higher order lags as instruments under the assumption of no serial correlation in the residual, u_{it}, in equation (1). With the Arellano-Bond's GMM estimator, the coefficient on income per capita is now negative in all panels, though also less precisely estimated.

Our second strategy, adopted in column 4, is to use the Griliches-Hausman (1986) long difference estimator proposed by Hahn, Hausman, and Kuersteiner (2007). This estimator shares features of the GMM estimator, though it arguably reduces the small sample bias inherent in the GMM estimation. Again, the coefficient on income per capita is negative in all panels.

Our third strategy, reproduced in column 5, estimates (1) with fixed effects OLS using annual observations. This is useful since the fixed effects OLS estimator becomes consistent as the number of observations becomes large. With annual observations, we have a reasonably large time dimension. However, estimating the same model on annual data with a single lag would induce significant serial correlation (since our results so far indicate that *five-year lags* of democracy predict changes in democracy). For this reason, we now include five lags of both democracy and log GDP per capita in these annual regressions. The table reports the p value of an F-test for the joint significance of these variables. The results show no evidence of a significant positive effect of income on democracy in any of the panels (while democracy is strongly predicted by its lags, as was the case in earlier columns).

A potential concern with fixed effects regressions is lack of precision due to insufficient residual variation in right-hand side variables. The results in Table 1 show that this is not the case in our empirical investigation. The standard errors of the estimates of the effect of income on democracy are relatively small in most cases, and as a result, two standard error

bands typically exclude the pooled OLS estimate from column 1 (even though, as discussed above, these are quantitatively small). For example, although the GMM estimates in column 3 are less precise than the fixed effects estimates in column 2, because the coefficient estimates are negative, two standard error confidence intervals exclude the pooled OLS estimate in panels A and B. The same is true, and more comfortably so, for the Griliches-Hausman long difference estimator in column 4, which leads to more precisely estimated effects. In this case, the pooled OLS estimate is outside the two standard error confidence intervals in all specifications. This shows that the lack of a positive effect of income per capita on democracy when we control for time-invariant omitted variables is not driven by imprecise estimates. Instead, it is likely due to the fact that these omitted variables are responsible for the positive relationship that previous cross-sectional (or pooled cross-section and time-series) studies have found.

In columns 5 and 6 of Table 1 we add average years of schooling and population as additional explanatory variables, and we repeat the regressions reported in columns 2 and 3 with very similar results. In particular, income never has a positive effect on democracy, and there is also no evidence of a positive relationship between education and democracy.

In regressions not reported here, we also checked for potential nonlinear interactions between income and other variables, and we found no evidence of such relationships.

Overall, the inclusion of fixed effects proxying for time-invariant and country-specific characteristics removes the entire cross-country correlation between income and democracy (and education and democracy). These results shed considerable doubt on the conventional wisdom that income has a strong causal effect on democracy.

4. Transitions to and from Democracy

In the previous section we focused attention on the level of democracy as the dependent variable. Much of the empirical literature since the work of Przeworski and Limongi (1997) and Przeworski et al. (2000) has instead focused on estimating separate models for transitions

to and away from democracy. In this section we investigate whether the findings in this literature are robust to the inclusion of fixed effects. We first investigate this question using a linear model. We then develop and implement a double hazard model for the simultaneous estimation of transitions to democracy and transitions away from democracy. All of our various econometric strategies show that once fixed affects are included to control for time-invariant omitted variables simultaneously affecting both income and democracy, there is no evidence of an effect of income per capita on transitions to or away from democracy.

4.1. Linear Model

Standard analyses of transitions to and from democracy use dichotomous measures such as the Przeworski/Boix-Rosato data. Here we start with a more straightforward approach which allows us to also use the continuous democracy scores in the Freedom House and Polity data. Our strategy is to modify the model in equation (1) as follows:

$$d_{it} = \alpha d_{it-1} + \gamma^{pos}\mathcal{I}_{it-1}y_{it-1} + \gamma^{neg}\left(1-\mathcal{I}_{it-1}\right)y_{it-1} + \mathbf{x}'_{it-1}\boldsymbol{\beta} + \mu_t + \delta_i + u_{it} \qquad (2)$$

where $\mathcal{I}_{it-1}=\{0,1\}$ is an indicator which equals 1 if d_{it-1} is below the sample mean and which equals 1 otherwise.[17] This procedure implies that γ^{pos} represents the effect of income on democracy conditional on a country starting from a low level of democracy, capturing the extent to which higher income may promote democratization. Analogously, γ^{neg} represents the effect of income on democracy conditional on a country starting from a high level of democracy, capturing the extent to which higher income may prevent coups.

Table 2 reports estimates of (2), where panel A uses the Freedom House data, panel B uses the Polity data, and panel C uses the dichotomous Przeworski index. Columns 1-5 of this table are analogous to columns 1-5 of Table 1 with the only differences being in the

[17] Although (2) is nonlinear in d_{it}, it is linear in the parameters and in particular, in the fixed effects, the δ_i's. This implies that the fixed effects can be differenced out to achieve consistent estimation (without creating an incidental parameters problem).

addition of the interaction terms for income on the right hand side of the equation.[18]

In the first columns of both tables we start with regressions without the fixed effects, the δ_i's, to replicate the results of the previous literature in our framework. The results in Table 2 using the pooled OLS approach show that there is a statistically significant correlation between income and transitions to and away from democracy with all three types of data.

Our main results, which add fixed effects, are presented in column 2. The findings here are similar to those reported in Table 1. Once we introduce the fixed effects, income per capita is never significant for either transitions to or away from democracy. Columns 3 and 4 turn to GMM and long difference estimation of the models with fixed effects. The estimates again show no evidence of an effect of income on either transitions to democracy or away from democracy. In column 5 we turn to the alternative strategy of using annual data. We again report the level of significance of an F-test on the joint significance of the lags of income per capita now interacted with the initial level of democracy, and we find that income per capita is insignificant in all specifications.

The results are thus consistent with those reported in Section 3.. With pooled OLS the coefficient on income per capita is significant on transitions to and transitions away from democracy, but once we add fixed effects, income is never significant in any specification.

4.2. Nonlinear Model

The linear probability models of transitions to and away from democracy reported so far are relatively transparent and also ensure consistency under a relatively weak set of assumptions (see Wooldridge, 2002, chapter 15.2). In addition, linear probability models allow us to use standard panel data techniques for consistent estimation in the presence of fixed effects (with large T) by differencing out the fixed effects. Nevertheless, nonlinear models may be more appropriate for understanding transitions to and away from democracy. The difficulty with nonlinear models lies in the fact that because the conditional mean function in such

[18] Analogous columns to columns 6 and 7 from Table 1 yield similar results and are available upon request.

models is not linear in the parameters, consistent estimation with fixed effects is typically not possible (see, for example, Wooldridge, 2002, chapter 15.8, and footnote 22).

We begin by developing and estimating a nonlinear double hazard model, which allows for cross-sectional correlation between income and democracy without introducing fixed effects. This allows us to relate the level of income to transitions to democracy and transitions away from democracy, without being subject to the same type of biases that pooled OLS estimation is subject to. Our use of the double hazard model is preferable to existing approaches relying on probit or duration model analysis since the model takes into account that transitions to democracy or away from democracy are jointly determined. In other words, transitions to and from democracy cannot be treated as separate events because whether or not an observation is in the *at-risk* sample is endogenously determined (or samples are endogenously selected). Our contribution here is to develop a framework for dealing with this issue which also allows the incorporation of fixed effects in a straightforward manner.

Our double hazard model can be expressed in terms of two conditional mean functions for the probability of transitioning to democracy and the probability of remaining in democracy:[19]

$$\Pr\left(d_{it}=1 \mid d_{it-1}=0, y_{it-1}, t\right) = \Phi\left(\gamma^{pos} y_{it-1} + \mu_t^{pos}\right) \tag{3}$$

$$\Pr\left(d_{it}=1 \mid d_{it-1}=1, y_{it-1}, t\right) = \Phi\left(\gamma^{neg} y_{it-1} + \mu_t^{neg}\right), \tag{4}$$

where Φ is an increasing function with a range between 0 and 1. Equation (3) describes the probability that a dictatorship collapses (transitions to democracy), and equation (4) describes the probability that a democracy survives, which is negatively related to the probability of a coup (transitions away from democracy). Together, these two equations characterize the law of motion of democracy for a given country, so that we can think of these

[19] Instead of (4), we could have alternatively written $\Pr\left(d_{it}=0 \mid d_{it-1}=1, y_{it-1}, t\right) = \Phi\left(\bar{\gamma}^{neg} y_{it-1} + \bar{\mu}_t^{neg}\right)$, in which case we would have $\Pr\left(d_{it}=1 \mid d_{it-1}=1, y_{it-1}, t\right) = 1 - \Phi\left(\bar{\gamma}^{neg} y_{it-1} + \bar{\mu}_t^{neg}\right)$. While these two specifications are econometrically equivalent, the interpretation of the parameters $\bar{\gamma}^{neg}$ and $\bar{\mu}_t^{neg}$ is less intuitive, making us prefer the system of equations given by (3) and (4).

equations as constituting a "double hazard model". The parameters γ^{pos} and γ^{neg} represent the effect of income on positive and negative transitions respectively, and μ_t^{pos} and μ_t^{neg} represent the time effects on positive and negative transitions, respectively. Note that equations (3) and (4) model the appropriate transitions to and away from democracy, but they do not yet introduce fixed country effects.

To make further progress, let us also assume that $\Phi(\cdot)$ is the normal cumulative distribution function, so that the system described by (3) and (4) is an *exponential* double hazard model. Since this system of equations characterizes the entire motion of democracy, it can easily be estimated by maximum likelihood.[20]

Table 3 reports estimates of (3) and (4) using the Przeworski/Boix-Rosato dichotomous measures of democracy. Column 1 of Table 3 estimates (3) and (4) simultaneously on a balanced panel and reports the estimates of the marginal effect of lagged income.[21] In panel A, we constrain $\gamma^{pos} = \gamma^{neg}$ and $\mu_t^{pos} = \mu_t^{neg}$. The estimates show a significant (cumulative) effect of income per capita on transitions to and away from democracy. In panel B, we allow $\gamma^{pos} \neq \gamma^{neg}$, while still constraining $\mu_t^{pos} = \mu_t^{neg}$. This is useful as a check of whether the impact of income differs in the two equations as emphasized by Przeworski and Limongi (1997) and Przeworski et al. (2000). Income per capita is significant for both transitions to and transitions away from democracy, though the coefficient on transitions away from democracy is higher and more significant, which is in line with the basic finding of these works. In panel C, we estimate the most flexible specification which allows for $\gamma^{pos} \neq \gamma^{neg}$ and $\mu_t^{pos} \neq \mu_t^{neg}$. The estimates are again similar.

The double hazard model, like all other models that are nonlinear in parameters, cannot accommodate fixed effects. For example, if fixed effects are added, the right hand side of equation (3) changes to $\Phi(\gamma^{pos} y_{it-1} + \mu_t^{pos} + \delta_i^{pos})$, and the right hand side of equation (4)

[20] The likelihood function is straightforward to compute. For example, for a given country i, we have that $\Pr\{d_{i1}, ..., d_{iT} | y_{i0}, ..., y_{iT-1}\} = \Pr\{d_{iT} | d_{iT-1}, y_{iT-1}, T\} \times \Pr\{d_{iT-1} | d_{iT-2}, y_{iT-2}, T-1\} ... \times \Pr\{d_{i1} | d_{i0}, y_{i0}, 1\}$.

[21] We focus on a balanced panel. Our results do not change if we instead modify the exercise to consider an unbalanced panel. Details available upon request.

changes to $\Phi\left(\gamma^{neg} y_{it-1} + \mu_t^{neg} + \delta_i^{neg}\right)$, where the δ_i's are the fixed effects for observation i. This specification creates an incidental parameters problem in the estimation of the δ_i's, and thus by implications, in the estimation of all of the parameters.[22]

We adopt the solution proposed by Mundlak (1978) and Chamberlain (1980), which involves imposing a functional form on the δ_i's. Specifically, Chamberlain (1980) posits that

$$\Pr\left(\delta_i^j = \delta \mid y_{i1}, ...y_{iT}\right) = \Phi\left(\overline{\alpha}^j + \overline{\mathbf{y}}_i \overline{\boldsymbol{\beta}}^j\right),\ j = pos, neg \tag{5}$$

where $\overline{\alpha}^j$ and $\overline{\boldsymbol{\beta}}^j$ are exogenous parameters, and $\overline{\mathbf{y}}_i$ is the average of $y_{i\tau-1}$ for $\tau = 1, ..., T$. The important assumption is that the component of δ_i^j which is uncorrelated with $\overline{\mathbf{y}}_i$ will be random in that it will not be correlated with d_{it}. As a consequence, we can write (incorporating the constant term $\overline{\alpha}^j$ into the time effects μ_t^j)

$$\Pr\left(d_{it} = 1 \mid d_{it-1} = 0, y_{it-1}, t\right) = \Phi\left(\gamma^{pos} y_{it-1} + \mu_t^{pos} + \overline{\mathbf{y}}_i \overline{\boldsymbol{\beta}}^{pos}\right) \tag{6}$$

$$\Pr\left(d_{it} = 1 \mid d_{it-1} = 1, y_{it-1}, t\right) = \Phi\left(\gamma^{neg} y_{it-1} + \mu_t^{neg} + \overline{\mathbf{y}}_i \overline{\boldsymbol{\beta}}^{neg}\right). \tag{7}$$

Notably, this specification is less flexible than including a full set of fixed effects, which was our strategy in the linear models, because it imposes considerable amount of structure on how unobserved heterogeneity (omitted time-invariant factors) affects democratic transitions. Consequently, this specification makes it less likely that we will be able to fully control for the effect of omitted variables simultaneously affecting income and democracy, and thus more likely that we may still find a spurious positive effect of income on transitions to and away from democracy. Nevertheless, column 2 of Table 3 shows that even with this more restrictive Chamberlain hazard model, there is no effect of income per capita on transitions to or away from democracy. Once again, in panel A, we constrain $\gamma^{pos} = \gamma^{neg}$, $\mu_t^{pos} = \mu_t^{neg}$, and $\overline{\boldsymbol{\beta}}^{pos} = \overline{\boldsymbol{\beta}}^{neg}$. In panel B, we allow $\gamma^{pos} \neq \gamma^{neg}$ but we constrain $\mu_t^{pos} = \mu_t^{neg}$ and

[22] In particular, because the number of parameters to be estimated increases at the same rate as the number of observations in the cross-section, the standard asymptotics do not guarantee consistency. This incidental parameters problem is avoided in linear models by differencing out the fixed effects, so that they do not have to be estimated. This then ensures consistent estimation of the remaining parameters.

$\overline{\boldsymbol{\beta}}^{pos} = \overline{\boldsymbol{\beta}}^{neg}$. In panel C, we allow $\gamma^{pos} \neq \gamma^{neg}$, $\mu_t^{pos} \neq \mu_t^{neg}$, and $\overline{\boldsymbol{\beta}}^{pos} \neq \overline{\boldsymbol{\beta}}^{neg}$. In all of these panels, the effect of income per capita is reduced and becomes insignificant. Overall, there is no evidence that income per capita has a causal effect on transitions to or away from democracy once we include controls for omitted variables simultaneously affecting the evolution of income and democracy.

Columns 3 and 4 are analogous to columns 1 and 2 on an annual balanced sample, and achieve similar results. Column 5 adds lagged population and lagged education to the sample of columns 1 and 2, where the averages of lagged population and lagged education are used in the calculation of (5), and again, income per capita has no effect on transitions to democracy or transitions away from democracy.

All in all, the results in the last two sections show that no matter what estimation approach one takes, controlling for omitted variables simultaneously affecting income and democracy–either by including a full set of fixed country effects or by using the parameterized approach of Chamberlain (1980)–removes the empirical relationship between income per capita and democracy.

5. Democracy and Income in the Long Run

We have so far followed much of the existing literature in focusing on the post-war period, where the democracy and income data are of higher quality. It is also important to investigate whether the relationship between income and democracy emerges over a longer period of time to take into account the development experiences of the late nineteenth and early twentieth centuries.

Although historical data are typically less reliable, the Polity IV dataset extends back to the beginning of the nineteenth century for all independent countries, as does the Boix-Rosato extension of Przeworski et al.'s dataset, and Maddison (2003) gives estimates of income per capita for many countries during this period. We therefore construct a data set starting from 1875, where we study the data in 25-year intervals in order to maximize the

cross-section of countries which can be observed. We construct a balanced panel of countries for which democracy, lagged democracy (calculated 25 years earlier), and lagged income (calculated 25 years earlier) are available for every 25th year between 1875 and 2000.[23] The result is a sample of 25 countries for the regressions using the Polity measure and a sample of 30 countries for the regressions using the Przeworski/Boix-Rosato measure.[24]

In Table 4 we present our fixed effects results with this long run panel. The specifications of columns 1-4 in Table 4 are identical to the specifications of columns 1-4 of Table 1 over the long 25 year sample where the dependent variable is the Polity index. In columns 5-8, the dependent variable is the Przeworski/Boix-Rosato index. The results in this table are very similar with either measure of democracy. Columns 1 and 5 report the basic pooled OLS regressions without fixed effects. These show the usual findings since income per capita has a positive coefficient and is strongly significant. Columns 2 and 6 then add the fixed effects, and the introduction of fixed effects makes income per capita insignificant. In columns 3 and 7, the use of the Arellano-Bond estimator causes income to have the wrong (negative) sign, and in columns 4 and 8, the use of the long difference estimator also causes income to have the wrong sign.

In Table 5 we examine whether there is a relationship between transitions to democracy and transitions away from democracy in this long run panel using the dichotomous Przeworski/Boix-Rosato measure of democracy. We again implement the double hazard model introduced in Section 4.2.. As before, we estimate the three possible models with differing degrees of flexibility in cross-equation restrictions.[25] As in the post-war panel, without

[23]For reasons of data availability, we assign income per capita in 1820 to 1850, income per capita in 1870 to 1875, and income per capita in 1929 to 1925. All of our results are robust to dropping the 1875 observation so as to not use the 1850 estimate of income per capita as the value of lagged income. For all observations, if income per capita is not available for a particular observation, it is estimated at the lowest aggregation level for which it is available, and the regressions are clustered by the highest aggregation level assigned to a particular country. We also assign the 1994 Przeworski/Boix-Rosato democracy score to 2000.

[24]Countries in both samples are Argentina, Austria, Belgium, Brazil, Chile, China, Colombia, Costa Rica, Denmark, El Salvador, Greece, Guatemala, Honduras, Mexico, Netherlands, Nicaragua, Norway, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States, Uruguay, Venezuela. The sample with Przeworski/Boix-Rosato measure additionally includes France, Japan, Peru, Portugal, and Spain.

[25]Specifically, Columns 1 and 2 correspond to the specifications of columns 1 and 2 of panel A of Table 3; columns 3 and 4 correspond to the specifications of columns 1 and 2 of panel B of Table 3; and columns 5

fixed effects the effect of income is large and significant on transitions to democracy and transitions away from democracy. However, once again when we include fixed effects to control for omitted variables simultaneously affecting the evolution of income and democracy, the relationship between income per capita and transitions to and away from democracy becomes insignificant.

The conclusion from this investigation is that the long run historical evolution of countries is similar to the evolution of countries in the post-1960 sample. Once we control for fixed effects, there is no significant relationship between income per capita and democracy.

6. Interpreting the Fixed Effects Results

In the introduction, we argued that the fixed effects results are consistent with the hypothesis that the (long run) political and economic development paths of societies are intimately linked. There is a natural complementarity between political and economic institutions. Economies grow if their economic institutions encourage investment and innovation, for example, by providing secure property rights and equality before the law; but this can only happen when those controlling political power (the political elites) are constrained. We should thus expect democracy to be associated with economic institutions that foster growth. This reasoning implies that if events at some critical juncture create a divergence in the political and economic institutions of a set of societies, we may expect these differences to persist over time; some of these societies may embark on a path to high income and democracy, while others experience relative stagnation and non-democracy.

Thus, according to this theory, democracy and income evolve jointly. Nevertheless, conditional on a given development path, economic growth does not necessarily lead to democratization.[26] This reasoning suggests that the fixed effects estimated in the previous section should be closely linked to the underlying institutional development paths and to the factors

and 6 correspond to the specifications of columns 1 and 2 of panel C of Table 3.

[26] Similarly, there is no natural presumption that, conditional on a particular development path, a temporary improvement in the democracy score should lead to higher incomes.

affecting what type of path a society has followed. We now investigate this question by seeing whether the presence of historical variables in the pooled cross-sectional regression can remove the statistical association between income and democracy.

Acemoglu, Johnson, and Robinson (2001, 2002) document that factors affecting the profitability of different institutional structures for European colonizers had a major impact on early institutions and on subsequent political and economic development in former European colonies. We therefore expect former European colonies with higher indigenous population density in 1500 to have experienced greater extraction of resources and repression by Europeans, and consequently to be less democratic today. However, population density in 1500 is subject to a large amount of measurement error, and it is only one of the influences on the ultimate choice of development path. For example, for various reasons, Europeans opted for extractive institutions in many areas, such as Brazil, with low population density. A direct measure of institutions immediately after the end of the colonial period is thus also useful to gauge the effect of the historical development paths on current outcomes. We therefore look at the measure of constraint on the executive from the Polity IV dataset right after independence for each former colony, measured as the average score during the first ten years after independence. This is the closest variable we have to a measure of institutions during colonialism. We normalize this score to a 0 to 1 scale like democracy, with 1 representing the highest constraint on the executive.[27] Finally, we also control for the date of independence. This is useful because constraint on the executive at different dates of independence may mean different things. In addition and potentially more importantly, countries where Europeans settled and developed secure property rights and more democratic institutions typically gained their independence earlier than colonies with extractive institutions. Another important effect of the date of independence on political and economic development might be that former colonies undergo a relatively lengthy period of instability

[27] For example, Peru had a constraint on the executive score equal to 0.33, while the United States's score was 1 at independence. These numbers are clearly indicative of the institutions that these countries had within the colonial period itself.

after independence, adversely affecting both growth prospects and democracy.[28]

To explore the nature of the fixed effects and the sources of the cross-sectional correlation between income and democracy in the former colonies sample, we begin by documenting analogous results to columns 1 and 2 of Table 1 for this sample in columns 1 and 2 of Table 6. They show that the positive and significant association between income and democracy present in the pooled cross-sectional regression disappears once fixed effects are introduced. To understand this result, we use two complementary strategies. First, columns 3 and 4 replace the fixed effects on the right hand side of (1) with historical, time-invariant country-specific variables. Column 3 introduces constraint on the executive at independence and the independence year of a country. The level of democracy is positively associated with constraint on the executive at independence and negatively associated with independence year (i.e., younger countries are less democratic). Importantly, the coefficient on income is reduced, for example from 0.067 in column 1 to 0.030 in column 3 of panel A. Column 4 introduces population density in 1500 to this specification and shows that the coefficient on population density in 1500 is negative in panels A and B. In panel A, the coefficient on income becomes 0.017 and is insignificant. These results suggest that our three historical variables are capturing (and removing) the same cross-sectional correlation between income and democracy is the fixed effects in column 2. Our second strategy for understanding the fixed effect is to directly regress the fixed effects from the specification in column 2 on the three historical variables to highlight the correlation between these fixed effects.[29] This regression is reported in column 5 shows a strong correlation between these fixed effects and the historical variables. For example, the R^2 is 0.68 in panel A.

Overall, this section has provided evidence that is consistent with our interpretation of the fixed effects results as capturing the impact of time-invariant, historical variables

[28] If we also use settler mortality, proposed and constructed in Acemoglu, Johnson and Robinson (2001), the results are similar, though the sample is smaller than the one used in Table 6. These results are available upon request.

[29] This regression should be interpreted as illustrative, since fixed effects in linear models, such as our specification in column 2, are not estimated consistently for the reasons discussed in footnote 22.

simultaneously affecting the evolution of income and democracy. It has documented that various historical variables that proxy for the factors influencing the subsequent evolution of institutions in former European colonies are closely related to the fixed effects from the democracy regressions. This pattern is consistent with the general thrust of the critical junctures hypothesis.

7. Conclusion

There is a general consensus in the empirical literature that the modernization hypothesis holds and that there is a causal effect of per capita income on democracy. In this paper, we argue that, though income and democracy are positively correlated, there is no evidence of a significant causal effect of income on democracy. Instead, omitted and most probably historical factors appear to have shaped the divergent political and economic development paths of various societies, leading to the positive association between economic performance and democracy. We provide an interpretation of our econometric results by considering the alternative critical junctures hypothesis and by linking the fixed effects to historical variables in the sample of former European colonies. We find that the fixed effects indeed capture the impact of historical differences which researchers have shown can account for economic and institutional divergence.

Our conclusion is that the relationship between income and democracy and the widely-accepted modernization hypothesis need to be reevaluated, with much greater emphasis on the underlying factors affecting both variables and the political and economic development path of societies. Our results should not be interpreted as implying that historical factors (or time-invariant factors captured by fixed effects) are the only or the major determinant of democracy today. There is a large amount of variability in democracy across countries that is not explained by our historical variables and also a substantial amount of over-time variability in the democracy score of a country that still needs to be understood and accounted for.[30] For

[30]In previous working papers, we have shown for example that the experience of an economic crisis is

example, it remains true that over time there is a general tendency towards greater incomes and education, and increased political participation across the world. In our regressions, time effects capture these general (world-wide) tendencies. Our estimates suggest that these world-level movements in democracy are unlikely to be driven by the causal effect of income and education on democracy. The causes of these world-wide trends are an interesting area for future research.

Bibliography

Acemoglu, Daron, Simon Johnson, and James A. Robinson (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, December, 91, 1369-1401.

Acemoglu, Daron, Simon Johnson, and James A. Robinson (2002) "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *Quarterly Journal of Economics*, 118, 1231-1294.

Acemoglu, Daron, Simon Johnson, James A. Robinson, and Pierre Yared (2008) "Income and Democracy," *American Economic Review, 98, 808-842.*

Anderson, Theodore W. and Cheng Hsiao (1982) "Formulation and Estimation of Dynamic Models using Panel Data," *Journal of Econometrics*, 18, 67-82.

Arellano, Manuel and Stephen R. Bond (1991) "Some Specification tests for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58, 277-298.

Barro, Robert J. (1999) "The Determinants of Democracy," *Journal of Political Economy*, 107, S158-S183.

Barro, Robert J. and Jong-Wha Lee (2000) "International Data on Educational Attainment: Updates and Implications," CID Working Paper #42.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan (2004) "How

positively related to democracy even when one controls for country fixed effects.

Much Should we Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119, 249 - 275.

Boix, Carles and Sebastián Rosato (2001) "A Complete Data Set of Political Regimes, 1800-1999," Unpublished, Department of Political Science, University of Chicago.

Bollen, Kenneth A. (1990) "Political Democracy: Conceptual and Measurement Traps," *Studies in Comparative International Development*, 25, 7-24.

Bollen, Kenneth A. (2001) "Cross-National Indicators of Liberal Democracy, 1950-1990" [Computer file]. 2nd ICPSR version. Chapel Hill, NC: University of North Carolina [producer], 1998. Inter-university Consortium for Political and Social Research [distributor].

Central Intelligence Agency (2004) *CIA World Factbook,* Website and Book. Washington, DC.

Chamberlain, Gary (1980) "Analysis of Covariance with Qualitative Data," *Review of Economic Studies*, 47, 225-238.

Engerman, Stanley L. and Kenneth L. Sokoloff (1997) "Factor Endowments, Institutions, and Differential Paths of Growth among New World Economies," in Stephen H. Haber ed. *How Latin America Fell Behind*, Stanford; Stanford University Press.

Freedom House (2004) *Freedom in the World,* Website and Book. Washington, DC.

Griliches, Zvi and Jerry Hausman (1986) "Errors in Variables in Panel Data," *Journal of Econometrics*, 31, 93–118.

Hahn, Jinyong, Jerry Hausman, and Guido Kuersteiner (2007) "Long Difference Instrumental Variable Estimation for Dynamic Panel Models with Fixed Effects," *Journal of Econometrics*, 140, 574-617.

Heston, Alan, Robert Summers, and Bettina Atten (2002) *Penn World Tables Version 6.1.* Center for International Comparisons at the University of Pennsylvania (CICUP).

Lipset, Seymour M. (1959) "Some Social Requisites of Democracy: Economic Development and Political Legitimacy," *American Political Science Review,* 53, 69-105.

Londregan, John B. and Keith T. Poole (1996) "Does High Income Promote Democracy?" *World Politics*, 49, 1-30.

Maddison, Angus (2003) *The world economy: historical statistics*, Development Centre of the Organization for Economic Cooperation and Development, Paris, France.

Marshall, Monty G. and Keith Jaggers (2004) "Political Regime Characteristics and Transitions, 1800-2002," Polity IV Project. University of Maryland.

McEvedy, Colin and Richard Jones (1975) *Atlas of World Population History*, New York; Facts on File.

Moore, Barrington (1966) *Social Origins of Dictatorship and Democracy*, Boston; Beacon Press.

Moulton, Brent R. (1986) "Random Group Effects and the Precision of Regression Estimates," *Journal of Econometrics*, XXXII, 385-397.

Mundlak, Yair (1978) "On the Pooling of Time Series and Cross Section Data," *Econometrica*, 46, 69-85.

Papaioannou, Elias and Gregorios Siourounis (2004) "Economic and Social Factors Driving the Third Wave of Democratization" Unpublished, London Business School.

Przeworski, Adam, Michael Alvarez, José A. Cheibub, and Fernando Limongi (2000) *Democracy and Development: Political Institutions and material well-being in the world, 1950-1990*, Cambridge University Press, New York NY.

Przeworski, Adam and Fernando Limongi (1997) "Modernization: Theory and Facts," *World Politics*, 49, 155-183.

Wooldridge, Jeffrey M. (2002) *Econometric Analysis of Cross Section and Panel Data*, MIT Press; Cambridge.

World Bank (2002) *World Development Indicators*, CD-ROM and Book. Washington, DC.

Table 1
Fixed Effects Results using Democracy

	Base Sample, 1960-2000						
	5-year data				Annual data	5-year data	
	Pooled OLS	Fixed Effects OLS	Arellano-Bond GMM	Griliches-Hausman LD	Fixed Effects OLS	Fixed Effects OLS	Arellano-Bond GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A	*Dependent Variable is Freedom House Measure of Democracy*						
Democracy $_{t-1}$	0.703	0.377	0.489	0.636	[0.00]	0.362	0.508
	(0.036)	(0.052)	(0.085)	(0.135)		(0.056)	(0.093)
Log GDP per Capita $_{t-1}$	0.073	0.008	-0.129	-0.043	[0.33]	-0.038	-0.153
	(0.010)	(0.034)	(0.076)	(0.046)		(0.042)	(0.133)
Log Population $_{t-1}$						-0.019	0.016
						(0.083)	(0.119)
Education $_{t-1}$						-0.012	-0.025
						(0.019)	(0.024)
Observations	955	955	838	103	2896	685	589
Countries	150	150	127	103	148	96	92
R-squared	0.72	0.79			0.93	0.76	
Panel B	*Dependent Variable is Polity Measure of Democracy*						
Democracy $_{t-1}$	0.748	0.447	0.590	0.920	[0.00]	0.453	0.633
	(0.034)	(0.063)	(0.106)	(0.122)		(0.068)	(0.112)
Log GDP per Capita $_{t-1}$	0.053	-0.003	-0.351	-0.016	[0.53]	-0.006	-0.229
	(0.010)	(0.038)	(0.127)	(0.049)		(0.044)	(0.186)
Log Population $_{t-1}$						0.160	0.156
						(0.081)	(0.106)
Education $_{t-1}$						-0.028	-0.027
						(0.021)	(0.028)
Observations	856	856	747	92	3705	643	541
Countries	136	136	114	92	134	93	91
R-squared	0.77	0.82			0.96	0.80	
Panel C	*Dependent Variable is Przeworski Measure of Democracy*						
Democracy $_{t-1}$	0.679	0.318	0.457	0.754	[0.00]	0.293	0.389
	(0.046)	(0.058)	(0.092)	(0.198)		(0.062)	(0.106)
Log GDP per Capita $_{t-1}$	0.097	0.051	-0.017	-0.040	[0.77]	0.052	0.107
	(0.018)	(0.055)	(0.138)	(0.070)		(0.088)	(0.233)
Log Population $_{t-1}$						0.066	0.301
						(0.144)	(0.206)
Education $_{t-1}$						-0.012	-0.045
						(0.045)	(0.040)
Observations	862	862	792	110	3720	619	524
Countries	123	123	118	110	119	95	93
R-squared	0.67	0.76			0.92	0.75	

Pooled cross-sectional OLS regression in column 1, with robust standard errors clustered by country in parentheses. Fixed effects OLS regressions in columns 2, 5, and 6, with country dummies and robust standard errors clustered by country in parentheses. Columns 3 and 7 use GMM of Arellano and Bond (1991), with robust standard errors; in both columns we instrument for income using a double lag. In column 4, we use the Griliches-Hausman (1986) long difference estimator with the lagged level of democracy as an instrument and with robust standard errors. Year dummies are included in all regressions. Dependent variable is Freedom House Measure of Democracy in panel A; Polity Measure of Democracy in panel B; and Przeworski Measure of Democracy in panel C. Base sample in columns 1, 2, 3, 4, 6, and 7 is an unbalanced panel, with data at 5-year intervals; the sample is 1960-2000 for columns 1, 2, 3, 6, and 7 and 1975-2000 for column 4 where the start date of the panel refers to the dependent variable (i.e., t=1960, so t-1=1955); column 5 uses annual data from the 1960-2000 unbalanced panel. In column 5, each right hand side variable has five annual lags; we report the p-value from an F-test for the joint significance of all 5 lags. See text for data definitions and sources.

Table 2
Fixed Effects Results using Transitions to and Away from Democracy

	Base Sample, 1960-2000				
	5-year data				Annual data
	Pooled OLS	Fixed Effects OLS	Arellano-Bond GMM	Griliches-Hausman LD	Fixed Effects OLS
	(1)	(2)	(3)	(4)	(5)
Panel A	*Dependent Variable is Freedom House Measure of Democracy*				
Democracy $_{t-1}$	0.685	0.328	0.466	0.513	[0.00]
	(0.062)	(0.075)	(0.109)	(0.370)	
Log GDP per Capita $_{t-1}$ on Transitions to Democracy	0.073	0.008	-0.135	-0.052	[0.35]
	(0.010)	(0.034)	(0.079)	(0.051)	
Log GDP per Capita $_{t-1}$ on Transitions away from Democracy	0.074	0.012	-0.133	-0.040	[0.34]
	(0.011)	(0.034)	(0.077)	(0.047)	
Observations	955	955	838	103	2896
Countries	150	150	127	103	148
R-squared	0.72	0.79			0.93
Panel B	*Dependent Variable is Polity Measure of Democracy*				
Democracy $_{t-1}$	0.822	0.550	0.710	1.310	[0.00]
	(0.068)	(0.107)	(0.137)	(0.260)	
Log GDP per Capita $_{t-1}$ on Transitions to Democracy	0.055	0.005	-0.320	0.019	[0.54]
	(0.011)	(0.039)	(0.131)	(0.056)	
Log GDP per Capita $_{t-1}$ on Transitions away from Democracy	0.048	-0.005	-0.332	-0.028	[0.60]
	(0.011)	(0.037)	(0.128)	(0.049)	
Observations	856	856	747	92	3705
Countries	136	136	114	92	134
R-squared	0.77	0.82			0.96
Panel C	*Dependent Variable is Przeworski Measure of Democracy*				
Democracy $_{t-1}$	0.102	-0.109	0.803	1.662	[0.00]
	(0.347)	(0.514)	(0.910)	(1.350)	
Log GDP per Capita $_{t-1}$ on Transitions to Democracy	0.068	0.031	0.084	0.007	[0.54]
	(0.022)	(0.056)	(0.210)	(0.094)	
Log GDP per Capita $_{t-1}$ on Transitions away from Democracy	0.137	0.084	0.037	-0.118	[0.78]
	(0.032)	(0.072)	(0.148)	(0.122)	
Observations	862	862	792	110	3720
Countries	123	123	118	110	119
R-squared	0.67	0.76			0.92

Columns 1-5 are isomorphic to columns 1-5 of Table 1 with log GDP per Capita$_{t-1}$ replaced with two interaction terms. Log GDP per Capita$_{t-1}$ Transitions to Democracy represents log GDP per Capita$_{t-1}$ interacted with a 0/1 dummy which equals 1 only if Democracy$_{t-1}$ is below the sample mean. Log GDP per Capita$_{t-1}$ Transitions away from Democracy represents log GDP per Capita$_{t-1}$ interacted with a 0/1 dummy which equals 1 only if Democracy$_{t-1}$ is above the sample mean. In column 5, each right hand side variable has five annual lags for each interaction term; we report the p-value from an F-test for the joint significance of all 5 lags. See text for data definitions and sources.

Table 3

Hazard Model using Przeworski Measure of Transitions to and away from Democracy

	Balanced Panel, 1965-1995				
	5-year data		Annual data		5-year data
	Exponential Hazard (Pooled)	Exponential Hazard (Chamberlain RE)	Exponential Hazard (Pooled)	Exponential Hazard (Chamberlain RE)	Exponential Hazard (Chamberlain RE)
	(1)	(2)	(3)	(4)	(5)
Panel A: Constrained Model	*Dependent Variable is Transitions to and away from Democracy*				
Log GDP per Capita $_{t-1}$	0.412	0.014	0.397	-0.052	-0.044
	(0.047)	(0.099)	(0.046)	(0.095)	(0.139)
Log Population $_{t-1}$					-0.263
					(0.277)
Education $_{t-1}$					0.030
					(0.071)
Observations	735	735	3180	3180	588
Countries	105	105	106	106	88
Panel B: Partially Constrained Model	*Dependent Variable is Transitions to and away from Democracy*				
Log GDP per Capita $_{t-1}$ on Transitions to Democracy	0.180	-0.050	0.080	-0.157	-0.081
	(0.039)	(0.113)	(0.028)	(0.089)	(0.148)
Log GDP per Capita $_{t-1}$ on Transitions away from Democracy	0.288	0.056	0.265	0.027	0.017
	(0.034)	(0.112)	(0.026)	(0.089)	(0.148)
Log Population $_{t-1}$					0.012
					(0.293)
Education $_{t-1}$					0.018
					(0.084)
Observations	735	735	3180	3180	588
Countries	105	105	106	106	88
Panel C: Unonstrained Model	*Dependent Variable is Transitions to and away from Democracy*				
Log GDP per Capita $_{t-1}$ on Transitions to Democracy	0.147	-0.101	0.085	-0.112	-0.135
	(0.049)	(0.108)	(0.029)	(0.077)	(0.148)
Log GDP per Capita $_{t-1}$ on Transitions away from Democracy	0.344	0.341	0.208	-0.010	0.308
	(0.089)	(0.279)	(0.049)	(0.099)	(0.336)
Log Population $_{t-1}$					0.017
					(0.085)
Education $_{t-1}$					0.219
					(0.349)
Observations	686	686	2062	2062	540
Countries	105	105	106	106	88

Pooled exponential hazard model in columns 1 and 3 and random effects exponential hazard model in columns 2, 4, and 5. Coefficients correspond to average marginal effects. Robust standard errors clustered by country in parentheses. Year dummies are included in all regressions. Dependent variable is Przeworski Measure of Democracy. Base sample in columns 1 and 2 is a balanced panel 1965-1995 with data at 5-year intervals, where the start date of the panel refers to the dependent variable (i.e., t=1965, so t-1=1960). Column 5 is the same panel for which population and education data is available. Columns 3 and 4 is a balanced panel 1965-1994 in annual intervals, where the start date of the panel refers to the dependent variable (i.e., t=1965, so t-1=1964). In columns 1 and 3, in panel A, the coefficients in equations (3) and (4) are constrained to be identical; in panel B, the coefficient on income is allowed to be different; in panel C, the coefficient on income and time effects are allowed to be different. In columns 2, 4, and 5, in panel A, the coefficients in equations (6) and (7) are constrained to be identical; in panel B, the coefficient on income is allowed to be different; in panel C, the coefficient on income, time effects, and country fixed effects are allowed to be different. See text for data definitions and sources and for a detailed discussion of estimation technique.

Table 4
Fixed Effects Results using Democracy in the Long Run

	Balanced Panel, 1875-2000							
	25-year data							
	Pooled OLS	Fixed Effects OLS	Arellano-Bond GMM	Griliches-Hausman LD	Pooled OLS	Fixed Effects OLS	Arellano-Bond GMM	Griliches-Hausman LD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable is Polity Measure of Democracy				*Dependent Variable is Przeworski Measure of Democracy*			
Democracy $_{t-1}$	0.487	0.192	0.439	0.924	0.311	0.042	0.215	1.067
	(0.085)	(0.119)	(0.143)	(0.211)	(0.102)	(0.119)	(0.143)	(0.176)
Log GDP per Capita $_{t-1}$	0.116	-0.020	-0.495	-0.247	0.259	0.163	-0.692	-0.328
	(0.034)	(0.093)	(0.266)	(0.123)	(0.048)	(0.104)	(0.198)	(0.157)
Observations	150	150	125	25	180	180	150	30
Countries	25	25	25	25	30	30	30	30
R-squared	0.55	0.65			0.53	0.63		

Pooled cross-sectional OLS regression in columns 1 and 5, with robust standard errors clustered by highest level of aggregation for income data in parentheses. Fixed effects OLS regressions in columns 2, and 6, with country dummies and robust standard errors clustered by highest level of aggregation for income data in parentheses. Columns 3 and 7 use GMM of Arellano and Bond (1991), with robust standard errors; we instrument for income using a double lag. Columns 4 and 8 use the Griliches-Hausman (1986) long difference estimator with the lagged level of democracy as an instrument and with robust standard errors. Year dummies are included in all regressions. Dependent variable is Polity Measure of Democracy in columns 1-4 and Przeworski Measure of Democracy in columns 5-8. Base sample is a balanced panel 1875-2000. All columns use 25-year data where the start date of the panel refers to the dependent variable (i.e., t=1875, so t-1=1850). GDP per capita is from Maddison (2003). See text for data definitions and sources.

Table 5
Hazard Model using Transitions to and away from Democracy in the Long Run

	Balanced Panel, 1875-2000					
	25-year data					
	Exponential Hazard (Pooled)	Exponential Hazard (Chamberlain RE)	Exponential Hazard (Pooled)	Exponential Hazard (Chamberlain RE)	Exponential Hazard (Pooled)	Exponential Hazard (Chamberlain RE)
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable is Transitions to and away from Democracy					
Log GDP per Capita $_{t-1}$	0.612	0.035				
	(0.082)	(0.159)				
Log GDP per Capita $_{t-1}$ on Transitions to Democracy			0.455	0.056	0.508	0.153
			(0.066)	(0.146)	(0.079)	(0.177)
Log GDP per Capita $_{t-1}$ on Transitions away from Democracy			0.509	0.103	0.533	0.206
			(0.064)	(0.145)	(0.082)	(0.226)
Observations	180	180	180	180	173	173
Countries	30	30	30	30	30	30

Pooled exponential hazard model in columns 1, 3, and 5, and random effects exponential hazard model in columns 2, 4, and 6. Robust standard errors clustered by highest level of aggregation for income data in parentheses. Year dummies are included in all regressions. Dependent variable is Przeworski Measure of Democracy. Base sample is a balanced panel 1875-2000. All columns use 25-year data where the start date of the panel refers to the dependent variable (i.e., t=1875, so t-1=1850). In column 1 the coefficients in equations (3) and (4) are constrained to be identical; in column 3, the coefficient on income is allowed to be different; in column 5, the coefficient on income and time effects are allowed to be different. In column 2 the coefficients in equations (6) and (7) are constrained to be identical; in column 4, the coefficient on income is allowed to be different; in column 6, the coefficient on income, time effects, and country fixed effects are allowed to be different. GDP per capita is from Maddison (2003). See text for data definitions and sources.

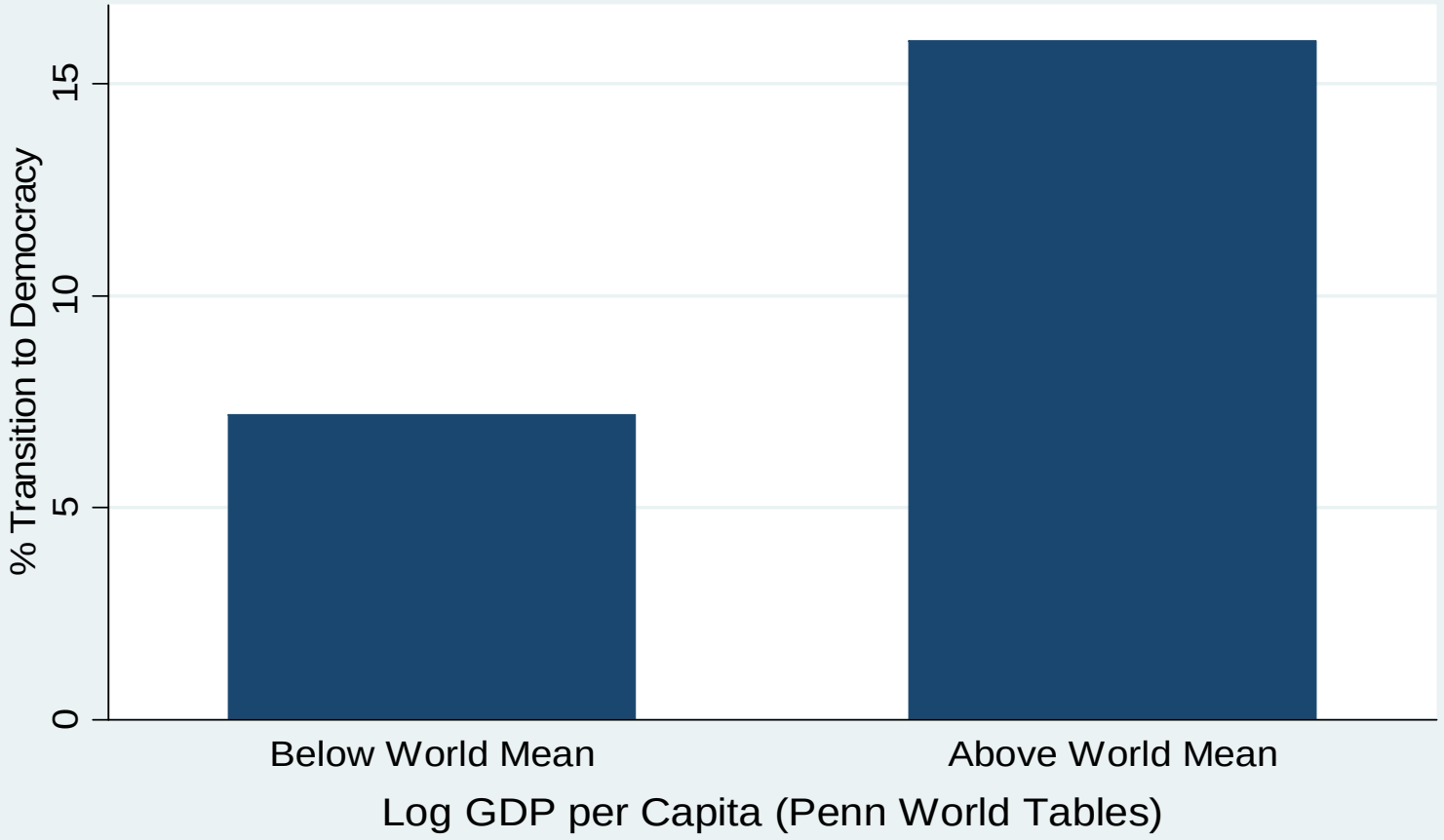
Table 6
Effect of Historical Institutions on Democracy: Former Colonies

	Former Colonies Sample, 1960-2000				
	5-year data				
	Pooled OLS (1)	Fixed Effects OLS (2)	Pooled OLS (3)	Pooled OLS (4)	Cross-Sectional OLS (5)
Panel A	*Dependent Variable is Freedom House Measure of Democracy*				*Dependent Variable is Fixed Effect from (2)*
Democracy $_{t-1}$	0.658	0.286	0.551	0.544	
	(0.049)	(0.058)	(0.047)	(0.046)	
Log GDP per Capita $_{t-1}$	0.067	-0.071	0.030	0.017	
	(0.014)	(0.039)	(0.012)	(0.014)	
Constraint on the Executive at Independence			0.189	0.195	0.401
			(0.030)	(0.029)	(0.048)
Independence Year/100			-0.102	-0.100	-0.201
			(0.015)	(0.015)	(0.028)
Log Population Density in 1500				-0.014	-0.041
				(0.006)	(0.011)
Observations	591	591	591	591	80
Countries	80	80	80	80	80
R-squared	0.61	0.71	0.64	0.64	0.68
Panel B	*Dependent Variable is Polity Measure of Democracy*				*Dependent Variable is Fixed Effect from (2)*
Democracy $_{t-1}$	0.715	0.352	0.624	0.618	
	(0.045)	(0.068)	(0.052)	(0.051)	
Log GDP per Capita $_{t-1}$	0.051	-0.043	0.019	0.008	
	(0.013)	(0.044)	(0.012)	(0.013)	
Constraint on the Executive at Independence			0.151	0.157	0.347
			(0.038)	(0.036)	(0.042)
Independence Year/100			-0.089	-0.088	-0.171
			(0.016)	(0.016)	(0.025)
Log Population Density in 1500				-0.011	-0.028
				(0.007)	(0.009)
Observations	559	559	559	559	80
Countries	80	80	80	80	80
R-squared	0.69	0.76	0.70	0.70	0.66
Panel C	*Dependent Variable is Przeworski Measure of Democracy*				*Dependent Variable is Fixed Effect from (2)*
Democracy $_{t-1}$	0.675	0.281	0.612	0.612	
	(0.057)	(0.072)	(0.062)	(0.062)	
Log GDP per Capita $_{t-1}$	0.084	0.001	0.037	0.041	
	(0.022)	(0.066)	(0.021)	(0.023)	
Constraint on the Executive at Independence			0.128	0.128	0.307
			(0.051)	(0.051)	(0.070)
Independence Year/100			-0.126	-0.128	-0.269
			(0.035)	(0.035)	(0.040)
Log Population Density in 1500				0.005	-0.004
				(0.012)	(0.016)
Observations	563	563	563	563	79
Countries	79	79	79	79	79
R-squared	0.58	0.70	0.60	0.60	0.46

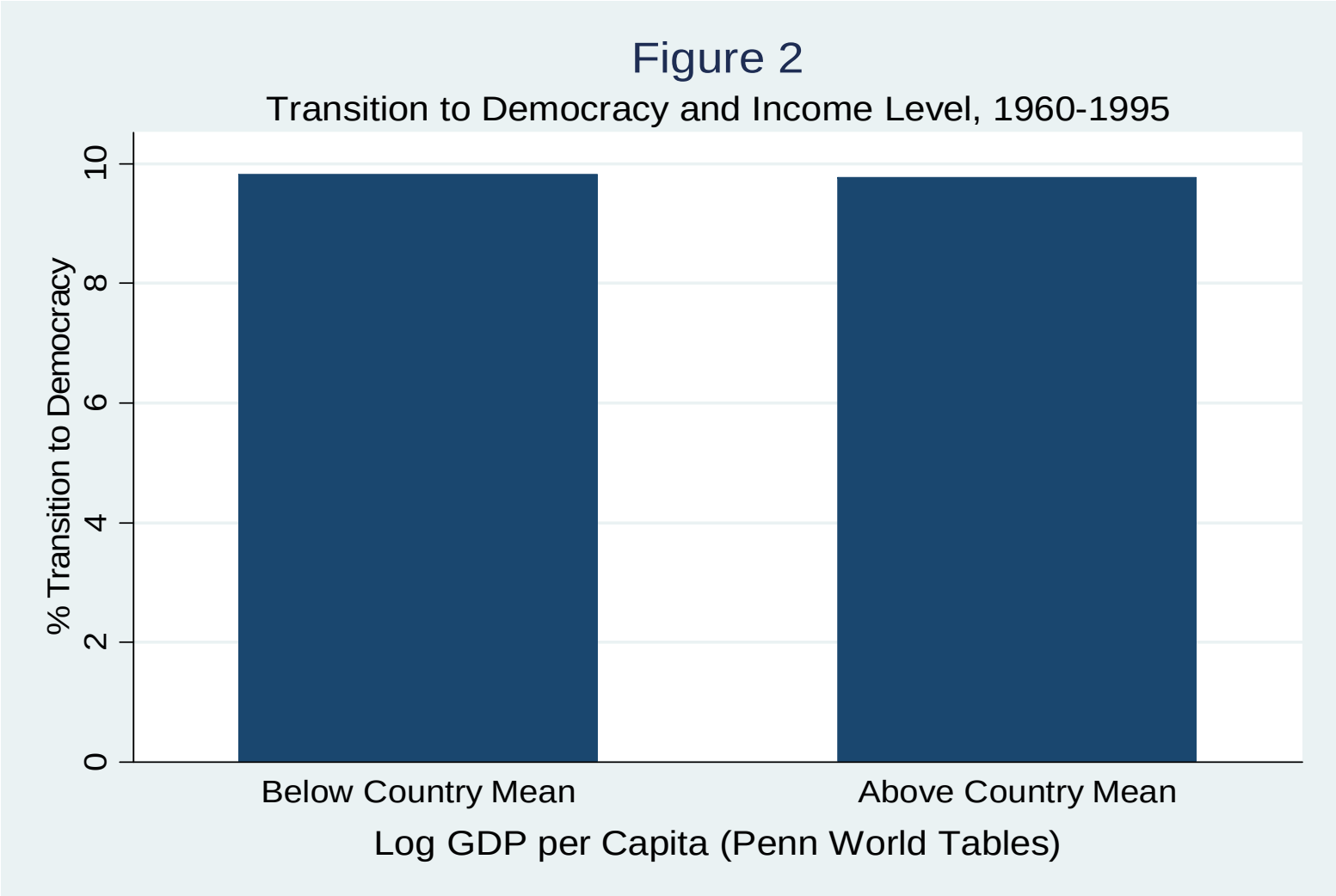
Pooled cross-sectional OLS regression in columns 1, 3, and 4 with robust standard errors clustered by country in parentheses. Fixed effects OLS regressions in column 2 with country dummies and robust standard errors clustered by country in parentheses. Weighted cross-sectional OLS in column 5. Year dummies are included in columns 1-4. For columns 1-4, dependent variable is Freedom House Measure of Democracy in panel A; Polity Measure of Democracy in panel B; and Przeworski Measure of Democracy in panel C. For columns 1-4, base sample is an unbalanced panel of former European colonies for which historical variables are available, 1960-2000, with data at 5-year intervals, where the start date of the panel refers to the dependent variable (i.e., t=1960, so t-1=1955). For column 5, dependent variable in panels A, B, and C is the country fixed effect calculated column 2 in panels A, B, and C, respectively. Weights correspond to the non-robust standard error of the country fixed effect calculated in column 2. See text for data definitions and sources.

Figure 1

Transition to Democracy and Income Level, 1960-1995



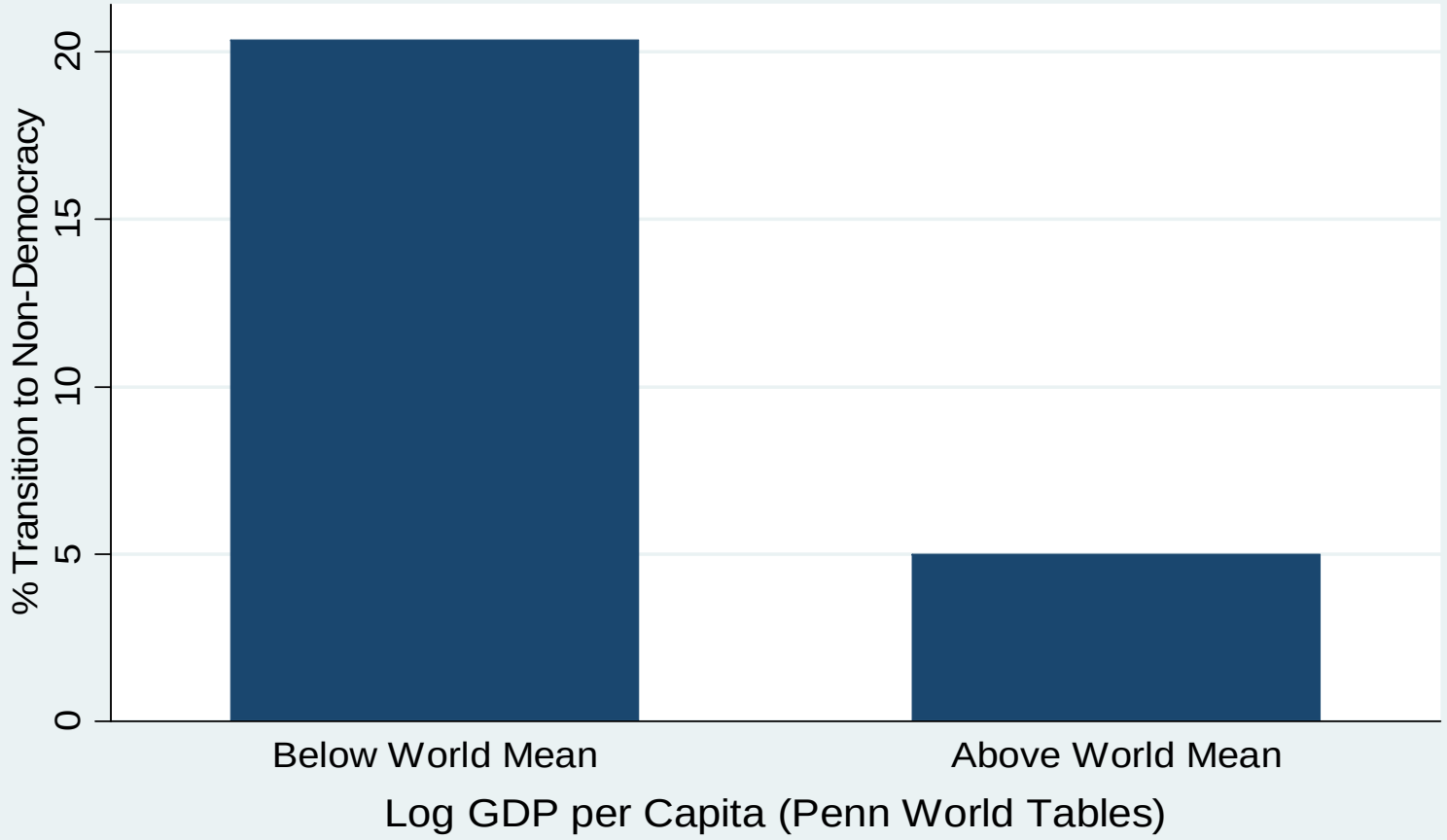
Sample includes all countries in five year intervals between 1955 and 1990 which are non-democratic according to the Przeworski Measure of Democracy for which at least two observations are available. Observations are grouped depending on whether log income per capita is above or below the average log income per capita in the world for the observation year. Each column measures the fraction of observations within each group which experience a transition to democracy five years later. See text for data definitions and sources.



Sample is the same as in Figure 1. Log income per capita for every observation is demeaned from the average log income per capita in the world for the observation year. Observations are grouped depending on whether demeaned log income per capita is above or below the average demeaned log income per capita in the country between 1955 and 1990. Each column measures the fraction of observations within each group which experience a transition to democracy five years later. See text for data definitions and sources.

Figure 3

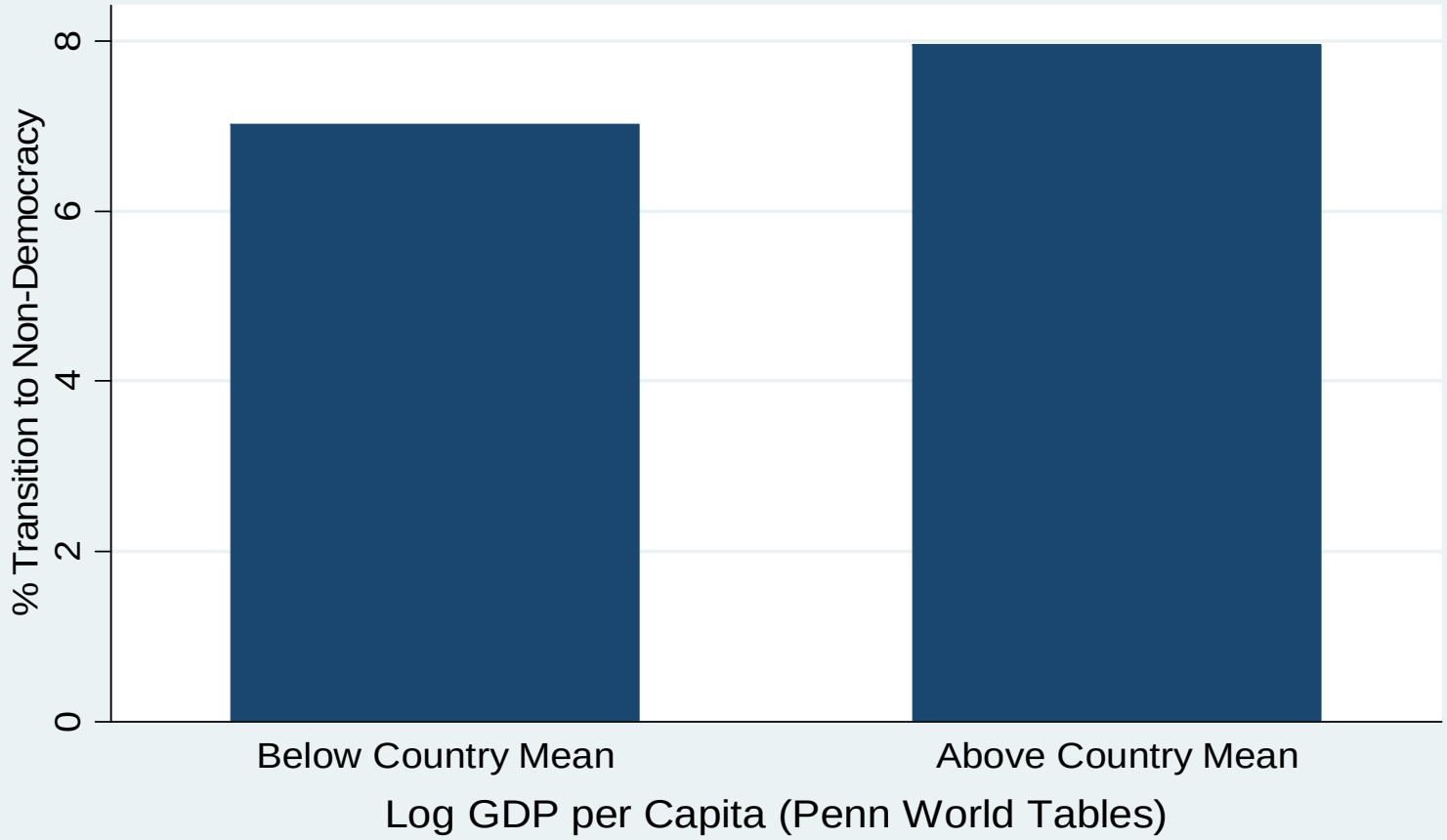
Transition to Non-Democracy and Income Level, 1960-1995



Sample includes all countries in five year intervals between 1955 and 1990 which are democratic according to the Przeworski Measure of Democracy for which at least two observations are available. Observations are grouped depending on whether log income per capita is above or below the average log income per capita in the world for the observation year. Each column measures the fraction of observations within each group which experience a transition to non-democracy five years later. See text for data definitions and sources.

Figure 4

Transition to Non-Democracy and Income Level, 1960-1995



Sample is the same as in Figure 3. Log income per capita for every observation is demeaned from the average log income per capita in the world for the observation year. Observations are grouped depending on whether demeaned log income per capita is above or below the average demeaned log income per capita in the country between 1955 and 1990. Each column measures the fraction of observations within each group which experience a transition to non-democracy five years later. See text for data definitions and sources.