



# IMF Working Paper

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## Income and Democracy: Lipset's Law Revisited

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## IMF Working Paper

Middle East and Central Asia Department

### Income and Democracy: Lipset's Law Revisited<sup>1</sup>

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#### Abstract

We revisit Lipset's law, which posits a positive and significant relationship between income and democracy. Using dynamic and heterogeneous panel data estimation techniques, we find a significant and negative relationship between income and democracy: higher/lower incomes per capita hinder/trigger democratization. Decomposing overall income per capita into its resource and non-resource components, we find that the coefficient on the latter is positive and significant while that on the former is significant but negative, indicating that the role of resource income is central to the result.

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## INTRODUCTION

Writing in 1959, Seymour Martin Lipset reported a strong and positive correlation between income per capita and democracy in a global cross section of nations (Lipset, 1959). Doing so, he not only laid the foundations of modernization theory in comparative politics but also defined a major portion of the contemporary agenda in political economy, with its focus on the relationship between political institutions and economic development.

Lipset's finding invites a dynamic and causal interpretation. It was therefore startling when estimating Markov transition models, Przeworski *et al.* (2000) failed to find a significant relationship between the level of income per capita and the likelihood of transition to democracy. While Boix and Stokes (2003) and Epstein *et al.* (2006) have challenged Przeworski *et al.*'s finding, it has subsequently been replicated by (Acemoglu, Johnson, Robinson and Yared, 2008) (henceforth AJRY). In our contribution, we focus on this last article and challenge their result.

In doing so, we report the presence, rather than the absence, of a significant statistical relationship between income and democracy for a group of countries that have been neither consistent democracies or non-democracies over the past 50 years. And the relationship we find is negative. To be noted is that AJRY also reported, but failed to comment upon, negative coefficients in their estimates.<sup>2</sup>

We take as our point of departure the important critique of (Gundlach and Paldam, 2008) (GP hereafter), who argue that by including year and country fixed effects AJRY purged from their panels useful information, thereby predisposing them to fail in their search for a relationship between income and democracy. In mounting this critique, GP highlight an important methodological dilemma: Including country specific fixed effects purges informative variation from the data; but excluding them introduces omitted variable bias. We confront – and surmount – this dilemma. Employing an augmented version of the Pooled Mean Group (PMG) estimator of Pesaran *et al.* (1999) we account for both country and year effects while relaxing the assumption of cross-sectional parameter homogeneity. Even while controlling for (time-invariant) omitted variables, we thereby extract information from sources of variation that were previously ignored.

In addition, inspired by the literature on the “rentier state” (Mahdavy, 1970; Beblawi and Giacomi, 1987; Chaudry, 1994) and the “political resource curse” (Barro, 1996; Barro, 1999, Ross, 1999, Ross, 2001), we decompose overall per capita income into its resource and non-resource components and find that the source as well as the level of income matters: the larger the portion originating from natural resource rents, the lower the level of democracy.

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<sup>2</sup> Their Table 2, cols. 3, 4 8, and 9; Table 3, cols 2, 3, 4, 8; and Table 4, cols 1, 2, 4,5,8, and 9.

## I. ADDITIONAL BACKGROUND

Given its central place in the literature, Lipset's law claims the central position in this paper. Our research resonates with two other literatures as well. One, which has already been mentioned, addresses the resource curse; the second focuses on the relationship between economic growth and political instability.

As noted by Ross (2001), in "rentier states", governments with large oil revenues reduce the level of political discontent by maintaining low taxes and high levels of public benefits. In addition, they spend more on internal security, forestalling the formation of political organizations inclined to demand political rights. Lastly, as Ross states: "if resource-led growth does not lead to higher education levels and greater occupational specialization", as has commonly been the case," it should also fail to bring about democracy" (Ross, 2001, p.336/337).

High income might co-vary with low levels of democratization for a second reason: growth reversals might spark political protests which result in the overthrow of incumbent regimes (Burke and Leigh, 2010). In the case of democracies, one party might supplant another in power; but in the case of authoritarian governments, the authoritarian regime might give way to a democracy, leading to an emerging relationship between low national income and democratic governance.

Haggard and Kaufman (1997) provide qualitative evidence that growth declines weaken authoritarian regimes, reducing their ability to trade political benefits for political deference (see also Geddes, 1999). Burke and Leigh (2010) develop a game theoretic model that illustrates how economic contractions can reduce the opportunity costs of political protest, including demands for democratic reforms. And in their survey of the literature on growth, Alesina and Perrotti (1994) use data on the average annual per capita rate of growth of GDP with and without government changes, documenting that income growth is lower in years with government change, still lower in years with major change, and lowest in years with coups. They conclude that "transitions from dictatorship to democracy, being associated with sociopolitical instability, should typically be periods of low growth" (Alesina and Perrotti 1994, p. 359). Londregan and Poole (1990) estimate a simultaneous equation model and similarly find that income per capita and economic growth are important determinants of coups: poverty and low growth increase the likelihood of coups. Over time, this channel too would yield a relationship between low income and democracy.

While our work targets Lipset's law and thus the *long-run* relationship between income per capita and democracy, it relates to these literatures as well.

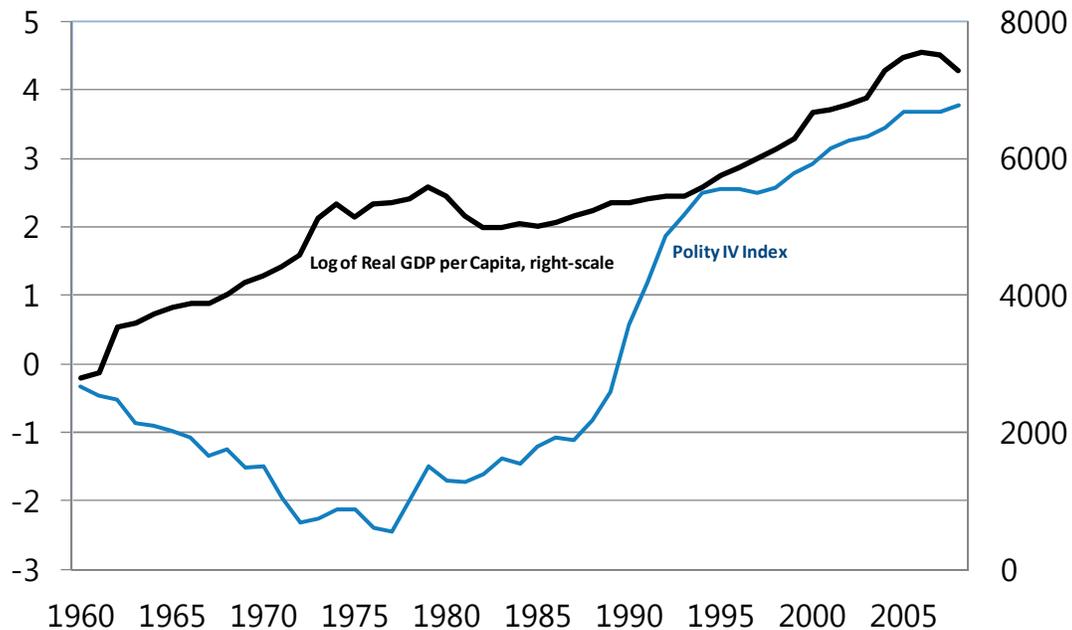
## II. DATA AND METHODS

Before testing Lipset's law, we first introduce our data and our methods.

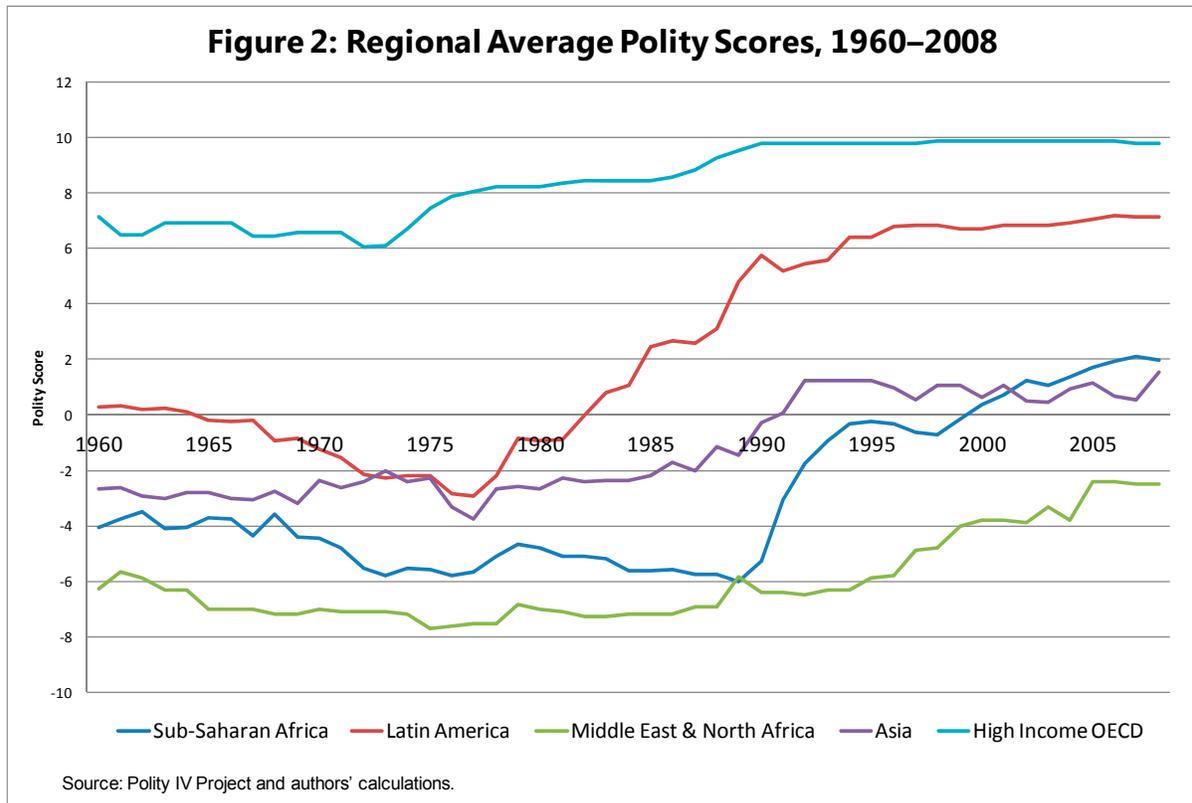
### A. Data

We use the Penn World Tables' (PWT 6.3) chain weighted real GDP per capita series and the Polity IV democracy index which distributes over a range spanning the interval between perfect autocracies (score of -10) and perfect democracies (score of 10). Based on a sample of 105 countries, Figure 1 shows that on average incomes and polity scores have risen over time. While incomes have grown relatively smoothly, in the late 1980s, the polity index jumped discontinuously from -0.4 in 1989 to 1.9 in 1992. As seen in Figure 2, which is based on the same sample, there are important regional differences in the movement toward democracy. While Asia and Latin America's Polity scores started on an upward trend in the late 1970s, Latin America/Asia democratized prior/post to the fall of Communism. Africa and the Middle East both democratized after 1990; their polity scores then diverged, with those in Sub-Saharan Africa improving more rapidly.

**Figure 1. Democracy and Income Global Averages, 1960–2008**



Sources: Penn World Tables 6.3, Polity IV Project and authors' calculations.



Our sample includes 105 countries. Its size and composition is limited by the method we employ. Because the heterogeneous PMG estimator (discussed below) computes coefficients for each country separately, we can include only countries with long time series<sup>3</sup> and must exclude countries with no time variation in the dependent variable.<sup>4</sup>

When we disaggregate income per capita by sources of income (resource and non-resource), we use the United Nations Statistics Division National Accounts Database. The data are available for 104 out of the 105 countries in our sample, but run only from 1970–2007. The data classify GDP into several categories, one of which includes Mining and Quarrying. We use this category as a measure of resource wealth. Data description in terms of definition and sources are provided in the Appendix.

<sup>3</sup> The countries we lose in this respect are: Armenia, Azerbaijan, Belarus, Croatia, Czech Republic, Eritrea, Estonia, Georgia, Kyrgyzstan, Kazakhstan, Latvia, Lithuania, Macedonia, Moldova, Namibia, Russia, Slovak Republic, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and Yemen.

<sup>4</sup> The countries dropped because they are either consistent democracies or consistent non-democracies are Australia, Austria, Belgium, Bhutan, Canada, Costa Rica, Cuba, Denmark, Finland, Ireland, Italy, Japan, Libya, Netherlands, New Zealand, Norway, Qatar, Saudi Arabia, Singapore, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States, and Vietnam.

## B. Methods

### Estimation technique

The PMG estimator allows intercepts, slope coefficients and error variances to vary across panel members. More specifically, it allows the short-run coefficients to vary across countries, while restricting long-run relationships to be homogeneous. In the context of this research, the estimator “assumes” that in the short run—or while adjusting to a common long-run equilibrium—each country’s political institutions respond differently to income shocks.

Because it allows for heterogeneous intercepts, the PMG estimator can incorporate country-specific fixed effects. But because it estimates the model for each country separately, it cannot allow the inclusion of year fixed effects. To correct for potential cross-section dependence in the estimated errors, we—as do Binder and Offermanns (2007)—therefore augment the model with the cross-sectional averages of the dependent variable and regressors.

We are particularly concerned with the possibility of error arising from two sources: unobserved sources of time specific heterogeneity and endogeneity bias.

*Time Specific Heterogeneity:* Given rapid increases in the global integration of financial and product markets, an economic shock could affect all units of a given cross section of a global sample. Heterogeneity would then introduce cross-section dependence in the errors of panel members, i.e. the errors would become contemporaneously correlated. In addition, if the same latent factor affects regressors and errors, the shock could be correlated with regressors, rendering conventional regressors inconsistent (Coakley *et al.*, 2006).

Given the difficulty of modeling error arising from cross-section dependence in panel data, few have attempted to do so (Phillips and Moon, 1999). As the PMG estimator estimates the model separately for each cross-section, we cannot employ time dummies to account for common temporal effects. Given our focus on the importance of heterogeneity, we are reluctant to assume common country responses to global factors through simple cross-sectional demeaning which attempts to extract the factors prior to estimation. Instead, we wish to include proxies of these common factors as right-side variables and employ PMG estimation to capture country-specific differences in short-run adjustments to them. We therefore follow Binders and Offermanns (2007) by allowing short-run heterogeneity in responses to both observed and unobserved factors, and thus augment the PMG model by proxies for global factors: the cross-sectional averages of all model’s variables.

*Endogeneity.* In Table 1 we present Granger causality tests. The data suggest the presence of reverse causality for our sample, which, if unattended, would introduce endogeneity bias in our estimates of the coefficient on income.

**Table 1: Granger Causality Tests**

Null hypothesis	Observations	Lags	F-stat	Probability
Democracy does not Granger cause income	4532	3	5.47	0.001
Income does not Granger cause democracy	4532	3	6.87	0.000

Source: Authors' calculations.

Note: In testing whether democracy Granger causes income, income is regressed on lags of income and democracy, and the reported F-stat is a Wald-type test of the joint significance of all estimated coefficients on such lags. We also report the probability of rejecting the null hypothesis.

We address endogeneity concerns in two ways. First, our preferred PMG estimator model is augmented with lags of the regressors and dependent variable to minimize the resultant bias and to ensure that the regression residuals are serially uncorrelated. Pesaran (1997) and Pesaran and Shin (1999) show that, for inference on the long-run parameters, sufficient augmentation of the order of the ARDL model can simultaneously correct for the problem of residual serial correlation and endogenous regressors. In choosing the optimal lag structure, we apply the Akaike Information Criterion (AIC) or the Schwartz Bayesian Criterion (SBC)). In doing so, we are constrained to a maximum of three lags by our time series dimension and number of our regressors.<sup>5</sup> Note that any remaining bias works against our conclusion: since our estimates yield negative signs, the coefficients should be even more negative once this bias is taken into account.

Second, we use alternative heterogeneous panel cointegration techniques that correct for endogeneity, namely the group mean Fully Modified OLS (FMOLS) of Pedroni (2000) and Dynamic OLS (DOLS) of Pedroni (2001).<sup>6</sup> Both methods allow for regressors' complete endogeneity, and treat all parameters, i.e. dynamics and cointegrating vectors, as heterogeneous across panel members. With group mean DOLS/FMOLS, the sample coefficients are simple averages of the member-specific DOLS/FMOLS estimators. More specifically, FMOLS runs a static OLS with fixed effects for each panel member individually and uses the estimated residuals to (non-parametrically) build member-specific adjustment terms, which are then used to correct for each member's endogeneity. Differences in regressors are used as internal

<sup>5</sup> To illustrate: Using SBC, we determine the lag order for each country, subject to a maximum lag of three; we then impose a homogeneous lag structure, using the most common of the country-specific lag orders. Note that another advantage of using the PMG ARDL approach is that there is no need for pre-testing our variables for the presence of unit roots. Pesaran *et al.* (1999) show the consistency of the PMG estimator in the case of I (0) and I (1) regressors.

<sup>6</sup> Developed as panel analogues of their time series versions respectively by Phillips and Hansen (1990) and Stock and Watson (1993).

instruments. Instead, DOLS individually corrects for endogeneity parametrically by running OLS with fixed effects for each panel member including leads and lags of differenced regressors.<sup>7</sup>

### ***The Model***

To summarize formally, let  $d_{it}$  represent democracy and  $y_{it}$  represent income per capita for country  $i$  at time  $t$ , and  $\bar{y}_t = N^{-1} \sum_{i=1}^N y_{it}$ ,  $\bar{d}_t = N^{-1} \sum_{i=1}^N d_{it}$  respectively represent their cross-sectional averages. The ECM with  $p$  lags on both the dependent and explanatory variables then is:

$$\begin{aligned} \Delta d_{it} = & \varphi_i (d_{i,t-1} - \mu_i - \beta y_{it} - \eta \bar{y}_t - \alpha \bar{d}_t) \\ & + \sum_{j=1}^{p-1} \lambda_{ij} \Delta d_{i,t-j} + \sum_{j=0}^{p-1} \delta_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{p-1} \nu_{ij} \Delta \bar{d}_{i,t-j} + \sum_{j=0}^{p-1} \omega_{ij} \Delta \bar{y}_{i,t-j} + \varepsilon_{it} \end{aligned} \quad (1)$$

Crucially, the error term  $\varepsilon_{it}$  is identically and independently distributed across  $i$  and  $t$  even in the presence of common time effects. Country intercepts -- unobserved country heterogeneity -- are captured by the term  $\mu_i$ .

The second part of equation (1) includes the lagged changes of income and democracy; the coefficients represent the short-run adjustment terms and are assumed to vary across countries. We do not report the short-run coefficients below. The first part of equation (1) captures the common long-run relationship between income and democracy. The slope coefficients—  $\beta$ ,  $\eta$ , and  $\alpha$  —measure the long-run response of democracy to income, world income and world democracy.  $\varphi$  is the error correction coefficient and indicates the speed of adjustment. If the system is dynamically stable and converges to a long-run equilibrium, then this coefficient will be negative and less than one in absolute value. We report these long-run coefficients below.

Starting with an initial estimate of the long-run parameters, the PMG estimator calculated estimates of error-correction and other short-run coefficients (including country-specific intercepts and error variances) as the averages of the estimated parameters for each cross-section.

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<sup>7</sup> It is worth noting that under endogeneity and no cointegration, using OLS produces first-order bias, and external instruments are needed. However, under endogeneity and cointegration, OLS produces superconsistent estimates and second-order endogeneity bias (i.e. inconsistent estimates of standard errors). Internal instruments are then used (such as in FMOLS-DOLS).

It then employs these average estimates to update its estimates of the long-run parameters, repeating the process until convergence is achieved.

Note that we also report (in Table 3) the mean group (MG) estimator (Pesaran and Smith, 1995) which allows for complete (short-run and long-run) parameter heterogeneity across panel cross-sections. If the slope coefficients are heterogeneous, the MG estimator is consistent. Since our cross-sectional dimension is large, the MG estimator is less likely to be biased by outliers. The mean group estimator does not take into account that some economic conditions tend to be common across countries in the long run, however. The PMG estimator does, and so captures efficiency gains from assuming common long-run relationships while at the same time allowing for heterogeneous short-run dynamics. Using the difference between the two sets of estimates, we employ a Hausman-type test to assess the assumption of long-run homogeneity.

### III. ESTIMATION AND RESULTS

We begin by employing an extended version of our dataset to reproduce the results of AJRY and GP. This dataset includes, in addition to our overall sample, all the countries that were dropped due to the restrictions imposed by PMG (as discussed above). This results in a sample of 153 countries for the annual data panel, and 129 countries for the five- and ten-year data panels, over the 1960–2000 period. As did AJRY, we find (Table 2, columns 1-3) that the coefficient on the income variable is positive and significant, when estimated from pooled data using ordinary least squares, but does not significantly differ from zero when including time and country fixed effects.<sup>8</sup> We also find that when we estimate their model employing our smaller PMG sample (Table 2, columns 4-6), their findings remain unchanged. Insofar as our results differ from those of earlier researchers, then, it is not because we are making use of different data. We next provide econometric evidence in support of that.

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<sup>8</sup> We only report results from the annual sample. We also reproduced but chose not to report their results with 5-year and 10-year data, because when allowing for fixed effects in short panels, the lagged dependent variable bias is large (Nickell, 1981).

**Table 2: Reproducing AJRY with Pooled OLS and Fixed Effects; Annual Data 1960–2000**

Dependent variable: Dem <sub>t</sub>	AJRY Sample			PMG Sample		
	Pooled 1	FE 2	FE 3	Pooled 4	FE 5	FE 6
Dem <sub>t-1</sub>	0.961*** (0.004)	0.897*** (0.011)	0.863*** (0.013)	0.949*** (0.005)	0.898*** (0.011)	0.854*** (0.013)
Log income per capita <sub>t-1</sub>	0.114*** (0.027)	0.407*** (0.112)	-0.110 (0.116)	0.161*** (0.038)	0.522*** (0.140)	0.002 (0.130)
Obs	4933	4933	4933	3836	3836	3836
Countries	153	153	153	105	105	105
R-squared	0.94	0.94	0.94	0.91	0.80	0.81
Country FE	NO	YES	YES	NO	YES	YES
Time FE	NO	NO	YES	NO	NO	YES

Source: Authors' calculations.

Notes: Robust standard errors (clustered at the country level) are reported in parentheses. \*\*\*, \*\*, and \* indicate significance respectively at the 1, 5, and 10 percent levels. All regressions include a constant. AJRY baseline specification includes year dummies and their distinction between pooled and fixed effects estimation is based on whether country fixed effects are included or not. We do not report regression results for when only annual dummies are accounted for but find that just like the AJRY results, the coefficient on lagged income per capita in this case is positive and significant and does not significantly differ in magnitude from its counterpart with no year and country dummies.

Table 3 presents the major (PMG) results derived from our model. Our results are reported in the first column of Table 3, while MG estimates appear in the second. The Hausman test in column 3 result testifies to the validity of the long-run homogeneity restrictions imposed by the PMG estimator.<sup>9</sup> The coefficients generated by the pooled mean estimator suggest *that income is negatively and significantly related to democracy*. Given that the model is linear log, they suggest that a 10 percent *increase* in per capita income leads in the long run to a roughly 0.12 unit *decrease* on the polity scale. While AJRY report negative coefficients for the relationship between income and democracy, they refrain from commenting upon them. We instead conclude that not only is there no positive relationship between income and democracy; the relationship is negative.

In contrast to the coefficients on per capita income, those on global changes in output and democratization over the sample period positively affected the level of democracy: both are significant and large. When the global democracy score increases by one unit, the democracy

<sup>9</sup> More specifically, the difference between both MG and PMG estimators is used to compute a Hausman-type statistic. Under the null hypothesis of long-run parameter homogeneity, both estimators are consistent, but the PMG is more efficient. When the true long-run parameters are instead heterogeneous, the MG estimator remains consistent while the PMG loses consistency.

score improves by an average of 0.8 units; and on average, a 10 percent increase in world income improves the democracy score by 0.3 units.

The error correction coefficient is significant; it suggests about 26 percent of error correction in the single-period response of democracy to a departure from its long-run equilibrium value as predicted by the level of per capita income. These results are robust to the optimal lag selection criterion (AIC vs. SBC), to the number of lags, to the cross-sectional demeaning of the data, and to whether Sub-Saharan Africa is included or not in the overall sample.

**Table 3: Augmented PMG Estimation; Overall Sample (N=105); 1955–2007**

Dependent variable: Polity IV measure of democracy			
Long-run coefficients	PMG	MG	Hausman Test
	1	2	3
Log income per Capita	-1.239*** (0.153)	0.39 (1.368)	1.44 [0.23]
World democracy	0.800*** (0.029)	0.926*** (0.143)	0.80 [0.37]
World output	3.059*** (0.547)	0.293 (2.958)	0.90 [0.34]
	Joint Hausman test		2.39 [0.50]
Error correction coefficient	-0.264*** (0.029)	-0.469*** (0.034)	

Source: Authors' calculations.

Notes: All equations include a constant country-specific term. Numbers reported in parentheses are standard errors. Numbers reported in brackets are p-values. \*\*\*, \*\*, and \* indicate significance respectively at the 1, 5, and 10 percent levels. We use the Schwartz Bayesian optimal lag selection Criterion subject to a maximum lag of three. World democracy and world output are respectively the cross-sectional averages of democracy and output which we take as proxies of the common unobserved global shocks.

Recall that GP found that when country fixed effects alone were included in the model, the coefficient on lagged income per capita was significant and positive. AJRY also reported negative and often significant coefficients for income in models which include both country and annual dummies.<sup>10,11</sup>

<sup>10</sup> Their Table 2, cols. 3, 4 and 8; Table 3, cols 2, 3, 4, 8; and Table 4, cols 1, 2, 8, 4.

<sup>11</sup> When we run the PMG without accounting for time effects, the coefficient on income per capita is instead positive and significant.

As discussed earlier, we also run the FMOLS and DOLS estimators on our sample. Results, shown in Table 4, point in the same direction: coefficients on income per capita are yet again found to be negative and statistically significant.<sup>12</sup>

**Table 4: FMOLS and DOLS; Overall Sample (1955–2007; N=105)**

Dependent variable: Democracy	DOLS	FMOLS
Log of income per capita	-2.293*** (0.189)	-0.503** (0.197)
Countries	105	105
Country and year FE	YES	YES

Source: Authors' calculations.

Notes: All equations include a constant country-specific term. Variables were cross-sectionally demeaned prior to estimation to account to ensure error cross-sectional independence. Numbers reported in parentheses are standard errors.\*\*\*, \*\*, and \* indicate significance respectively at the 1, 5, and 10 percent levels.

## Discussion

When analyzing the difference between our findings and those of AJRY, it is useful to turn to Table 5, which reports the results we secure when we employ the pooled error correction OLS model to regress democracy on its lags and on the level of income per capita (also with lags, and country and year fixed effects) while using the PMG sample. As can be seen, we then get negative and significant long-run coefficients on income per capita in our PMG sample, and the magnitudes are similar to our long-run PMG coefficients (discussed below). However, estimating the pooled error correction model while using the AJRY (bigger) sample<sup>13</sup> yields long-run coefficients on income per capita that are insignificant, regardless of the number of lags.<sup>14</sup>

<sup>12</sup> Please see Figure A in the Appendix for the country-specific coefficients on income per capita in the FMOLS regression.

<sup>13</sup> Which, unlike our own, includes countries with no time-variation in democracy variable;

<sup>14</sup> There is also evidence in this sample that democracy and income per capita are I(1) and cointegrated using Im, Pesaran and Shin (2003) unit root tests and Pedroni (1999, 2004) cointegration tests.

**Table 5: Pooled Error Correction Model by OLS With Country and Year Fixed Effects  
on the PMG Sample (1960–2007; N=105)**

Dependent variable: Democracy Long-run coefficient	Lags=2	Lags=3	Lags=4	Lags=5
	1	2	3	4
Log of income per capita	-1.325*	-1.236	-1.595*	-1.683*
	(p-value=0.07)	(p-value=0.11)	(p-value=0.07)	(p-value=0.06)
Error correction coefficient	-0.141***	-0.145***	-0.142***	-0.144***
R-squared	0.85	0.85	0.85	0.85
Countries	105	105	105	105
Observations	4453	4348	4243	4138
Country and year FE	YES	YES	YES	YES

Source: Authors' calculations.

Note: we do not report the short-coefficients on income per capita (which are statistically insignificant). The p-values for the long-run coefficients are calculated with the non-linear test procedure “testnl” in Stata, and indicate the level of significance at which we can reject that the long run-coefficient is zero.

The difference between our results and those of AJRY thus arise from 1) our estimation methods, which exploit both the dynamic and heterogeneous properties of the data and 2) our samples, which exclude both consistent autocracies and consistent democracies, as noted above. The differences in the samples prove consequential: by restricting our sample to country-years that experienced changes in both their incomes and polity scores, i.e. countries that witnessed movements either away or towards more democracy, we are able to detect the relationship between income and democracy, one that turned out to be significantly negative.<sup>15</sup> Both the sample choice and the methodology thus led us to our results.

It is also worth noting that in relation to Figure 2, where global income and democracy appear to be negatively correlated up to 1985, we check whether our results on the negative relationship between income and democracy are driven by the pre-1985 period. Estimating both the PMG and the pooled OLS ECM for the sub-period 1985-2007, results (not reported here) maintain the same negative relationship, with the only difference that global output in the PMG model is now significantly *negatively* related to democracy.

#### IV. DIGGING DEEPER

In this section, we explore the possible impact of additional sources of variation: variation in the composition of the national income and regional relationships between income and democracy.

<sup>15</sup> This relationship was also picked up by a simple pooled (non-heterogeneous) OLS error correction model.

**The sectoral composition of output:** Returning to the literature on the “rentier state” (Mahdavy, 1970; Beblawi and Giacomi, 1987; Chaudry, 1994) and the “resource curse” (Barro, 1996, Barro, 1999; Ross 1999, Ross, 2001), we augment our baseline regression with the World Bank measure of natural resource rents as a percent of GDP. Doing so reduces our overall sample to 98 countries over the period 1970-2007. As seen in Table 6, we too find a negative and significant coefficient for the relationship between resource rents and democracy.

**Table 6: Augmented PMG Estimation with Resource Rents; N=98; 1970–2007**

Dependent variable: Polity IV measure of democracy			
Long-run coefficients	PMG	MG	Hausman Test
	1	2	3
Log income per capita	-0.651*** (0.157)	-2.500 (4.726)	0.19 [0.67]
Natural resource rents to GDP	-0.021*** (0.005)	-0.141 (1.440)	0.01 [0.93]
World democracy	1.211*** (0.035)	1.225*** (0.322)	0.00 [0.97]
World output	-8.554*** (1.268)	-4.031 (5.799)	0.64 [0.42]
World rents	0.201*** (0.038)	-0.241 (0.382)	1.35 [0.25]
	Joint Hausman test		4.2 [0.52]
Error correction coefficient	-0.355*** (0.039)	-0.664*** (0.057)	

Source: Authors' calculations.

Notes: All equations include a constant country-specific term. Numbers reported in parentheses are standard errors. Numbers reported in brackets are p-values. \*\*\*, \*\*, and \* indicate significance respectively at the 1, 5, and 10 percent levels. We use the Schwartz Bayesian optimal lag selection Criterion subject to a maximum lag of three. World democracy, world output and world rents are respectively the cross-sectional averages of democracy, output, and natural resource rents to GDP which we take as proxies of the common unobserved global shocks.

Table 7 decomposes national income into two components: that deriving from natural resources and that deriving from other sources. Our sample now consists of the 102 countries over the period 1970-2007. To highlight the results of interest, we refrain from reporting the coefficients on the cross-sectional averages. Column 1 of Table 7 reproduces the specification employed in Table 3, but estimated from the current sample. The coefficients of interest remain roughly the same as that in Table 3. Columns 2, 3, and 4 report the PMG coefficient on resource and non-

resource GDP per capita, first separately and then combined. The results confirm that it is only the resource proportion of income per capita that is negatively and significantly related to democracy.

**Table 7: Augmented PMG Estimation with Sectoral Output; N=102; 1970–2007**

Dependent variable: Polity IV measure of democracy				
Long-run PMG coefficients	1	2	3	4
Log Income per capita	-1.228*** (0.259)			
Log of resource GDP per capita		-0.306*** (0.081)		-0.295*** (0.081)
Log of non-resource GDP per capita			0.710** (0.271)	0.518* (0.272)
Error correction coefficient	-0.305*** (0.034)	-0.248*** (0.029)	0.245*** (0.030)	-0.307*** (0.034)

Source: Authors' calculations.

Notes: All equations include a constant country-specific term. Numbers reported in parentheses are standard errors. Numbers reported in brackets are p-values. \*\*\*, \*\*, and \* indicate significance respectively at the 1, 5, and 10 percent levels. We use the Schwartz Bayesian optimal lag selection Criterion. All regressions include cross-sectional averages of the dependent variable and all regressors. Hausman test results for the coefficients of interest, not reported here, fail to reject the null of long-run cross-section parameter homogeneity.

## V. CONCLUSION

In this paper we have scrutinized Lipset's law, which states that there is a positive and significant relationship between income and democracy and that higher incomes lead to democratization (Lipset, 1959). Lipset's law is commonly regarded as the foundation of modernization theory in comparative politics and the debate over it shapes the contemporary agenda in development economics, with its focus on the relationship between political institutions and economic development.

We revisit this debate and use dynamic panel data methods to examine the direction of causation as well as the short and long run relationship between democracy and income. Our tests fail to establish the direction of causality: income 'Granger' causes democracy and vice versa. With this in mind, we turned to modelling democracy as a function of income. We use the augmented PMG estimator (Pesaran et al., 1999) which enables us to examine the short/long run relationship while allowing for country and year effects as well as for parameter heterogeneity across panel members. Accounting for the dynamics, we then find a significant and negative relationship between income and democracy for the group of countries that have been neither consistent

democracies nor consistent non-democracies over the sample period. Doing so, we draw information from two sources of variation overlooked by previous scholars. One is cross country variation in the short term responses to income shocks; another is variation in the structure and composition of income. In countries that receive little or no income from resources the relationship between democracy and income is positive and significant. In resource rich countries, the reverse is true: higher incomes bear a negative relationship with democracy.

## Appendix

Table A: List of Countries and Time Periods with Available Polity and GDP per Capita Data

Afghanistan	1970–2000	Kenya	1963–2007
Albania	1970–2007	Korea, Rep.	1955–2007
Algeria	1962–2007	Kuwait	1970–2007
Angola	1975–2007	Laos	1970–2007
Argentina	1955–2007	Lebanon	1970–2007
Bahrain	1971–2006	Lesotho	1966–2007
Bangladesh	1972–2007	Liberia	1955–2007
Benin	1960–2007	Madagascar	1960–2007
Bolivia	1955–2007	Malawi	1964–2007
Botswana	1966–2007	Malaysia	1957–2007
Brazil	1955–2007	Mali	1960–2007
Bulgaria	1955–2007	Mauritania	1960–2007
Burkina Faso	1960–2007	Mauritius	1968–2007
Burundi	1962–2007	Mexico	1955–2007
Cambodia	1970–2007	Mongolia	1955–2007
Cameroon	1960–2007	Morocco	1956–2007
Central African Rep.	1960–2007	Mozambique	1975–2007
Chad	1960–2007	Nepal	1955–2007
Chile	1955–2007	Nicaragua	1955–2007
China	1955–2007	Niger	1960–2007
Colombia	1955–2007	Nigeria	1960–2007
Comoros	1975–2007	Oman	1955–2007
Congo, Dem. Rep.	1960–2007	Pakistan	1955–2007
Congo, Rep.	1960–2007	Panama	1955–2007
Cote d'Ivoire	1960–2007	Paraguay	1955–2007
Cyprus	1960–2007	Peru	1955–2007
Djibouti	1977–2007	Philippines	1955–2007
Dominican Republic	1955–2007	Poland	1970–2007
Ecuador	1955–2007	Portugal	1955–2007
Egypt, Arab Rep.	1955–2007	Romania	1955–2007
El Salvador	1955–2007	Rwanda	1961–2007
Equatorial Guinea	1968–2007	Senegal	1960–2007
Ethiopia	1955–2007	Sierra Leone	1961–2007
Fiji	1970–2007	Solomon Islands	1978–2007
France	1955–2007	Somalia	1970–2007
Gabon	1960–2007	South Africa	1955–2007
Gambia	1965–2007	Spain	1955–2007
Ghana	1960–2007	Sri Lanka	1955–2007
Greece	1955–2007	Sudan	1956–2007
Guatemala	1955–2007	Swaziland	1970–2007
Guinea	1958–2007	Syrian Arab Rep	1961–2007
Guinea-Bissau	1974–2007	Tanzania	1961–2007
Guyana	1966–2007	Thailand	1955–2007
Haiti	1955–2007	Togo	1960–2007
Honduras	1955–2007	Trinidad & Tobago	1962–2007
Hungary	1957–2007	Tunisia	1961–2007
India	1955–2007	Turkey	1955–2007
Indonesia	1955–2007	Uganda	1962–2007
Iraq	1970–2002	Uruguay	1955–2007
Iran, Islamic Rep.	1955–2007	Venezuela, RB	1955–2007
Israel	1955–2007	Zambia	1964–2007
Jamaica	1959–2007	Zimbabwe	1970–2007
Jordan	1955–2007		

Source: Penn World Tables 6.3 and Polity IV Project.

**Table B: Descriptive Statistics**

Variables	Obs	Countries	Mean	Std. Dev.	Min	Max
Tables 3, 4						
Democracy	5085	105	-1.0	6.9	-10.0	10.0
Log of Real Income per Capita	5076	105	8.0	1.0	5.0	11.5
Table 5						
Democracy	3693	98	-0.4	7.0	-10.0	10.0
Log of Real Income per Capita	3723	98	8.1	1.0	5.0	11.5
Rents to GDP	3724	98	7.7	13.5	0.0	116.5
Table 6						
Democracy	3834	102	-0.4	7.0	-10.0	10.0
Log of Real Income per Capita	3875	102	8.1	1.0	5.0	11.5
Log of Resource Income per Capita	3869	102	5.2	1.8	-2.4	11.1
Log of non-Resource Income per Capita	3875	102	8.0	1.0	5.0	10.5
Share of Resource Income	3876	102	10.0	13.9	0.0	77.5

Source: Authors' calculations.

**Table C: Share of Resource GDP in Overall GDP**

Albania	22.1	Korea, Rep.	3.0
Algeria	31.4	Kuwait	48.0
Angola	39.5	Laos	4.6
Argentina	4.7	Lebanon	3.5
Bahrain	22.4	Lesotho	2.9
Bangladesh	1.4	Liberia	12.1
Benin	1.5	Madagascar	1.4
Bolivia	12.7	Malawi	3.3
Botswana	35.6	Malaysia	12.4
Brazil	3.8	Mali	4.3
Bulgaria	9.8	Mauritania	15.2
Burkina Faso	2.2	Mauritius	2.2
Burundi	0.7	Mexico	9.8
Cambodia	2.3	Mongolia	15.5
Cameroon	6.9	Morocco	5.8
Central African Rep	6.1	Mozambique	2.4
Chad	5.6	Nepal	1.3
Chile	13.4	Nicaragua	2.7
Colombia	6.3	Niger	7.3
Comoros	1.2	Nigeria	27.2
Congo, Dem. Rep.	12.7	Oman	47.6
Congo, Rep.	34.8	Pakistan	4.7
Cote d'Ivoire	2.8	Panama	3.1
Cyprus	3.0	Paraguay	1.6
Djibouti	5.3	Peru	12.5
Dominican Republic	3.3	Philippines	3.7
Ecuador	13.3	Poland	8.2
Egypt, Arab Rep.	8.9	Portugal	2.8
El Salvador	1.9	Romania	6.4
Equatorial Guinea	29.0	Rwanda	1.3
Fiji	3.7	Senegal	3.4
France	2.1	Sierra Leone	13.2
Gabon	42.2	Solomon Islands	1.0
Gambia	1.3	Somalia	0.7
Ghana	4.9	South Africa	13.3
Greece	3.3	Spain	2.9
Guatemala	2.5	Sri Lanka	2.6
Guinea	18.2	Sudan	3.1
Guinea-Bissau	0.7	Swaziland	4.8
Guyana	13.1	Syria	13.0
Haiti	1.5	Tanzania	8.5
Honduras	2.1	Thailand	4.0
Hungary	7.7	Togo	8.4
India	4.3	Trinidad & Tobago	22.2
Indonesia	12.7	Tunisia	7.9
Iran, Islamic Rep.	20.2	Turkey	2.9
Iraq	77.5	Uganda	2.6
Israel	2.5	Uruguay	2.7
Jamaica	9.0	Venezuela, RB	19.5
Jordan	5.3	Zambia	16.5
Kenya	3.8	Zimbabwe	6.7

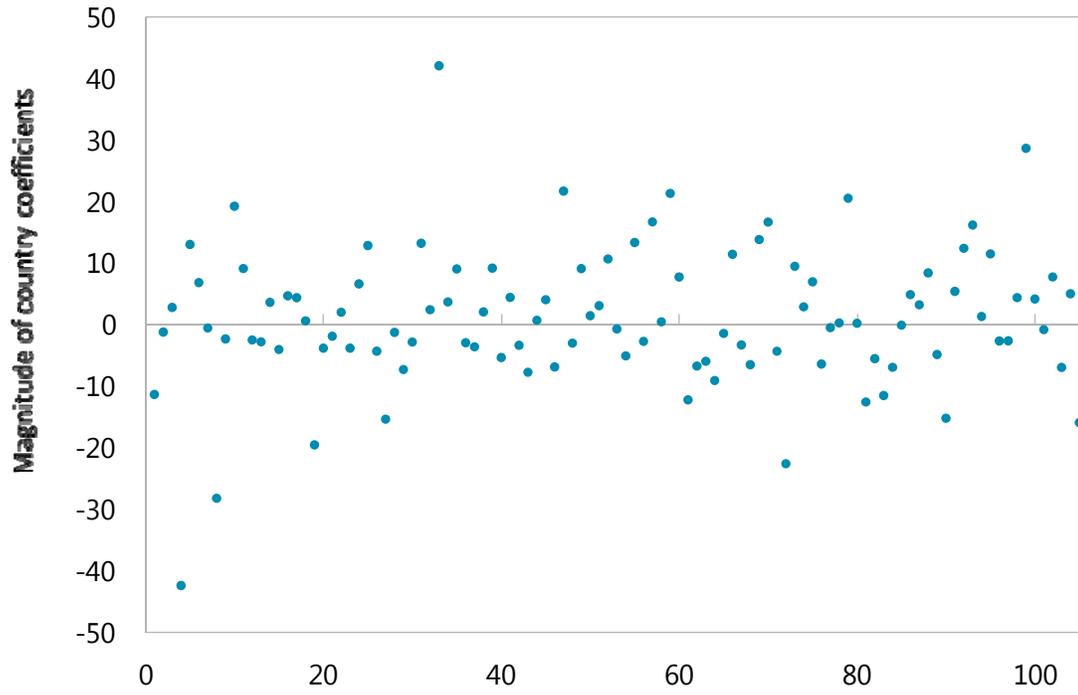
Source: United Nations Statistics Division National Accounts Database and authors' calculations.

UN Statistics Division National Accounts Database which provides data from 1970–2007 on sectoral GDP shares for the following overall categories: 1. Agriculture, hunting, forestry, fishing; 2. Mining, Manufacturing, Utilities; 3. Manufacturing; 4. Construction; 5. Wholesale, retail trade, restaurants and hotels; 6. Transport, storage and communication; 7. Other Activities. Category 2 (Mining, manufacturing and utilities) is an aggregation of economic activities of a. Mining and quarrying, b. Manufacturing and c. Utilities. The data available allows us to compute Mining, Quarrying and Utilities by subtracting Category 3 (Manufacturing) from Category 2 (Mining, Manufacturing, Utilities). We take this as our proxy of resource GDP. Unfortunately UN data on Mining and Quarrying alone involve short time series dimensions for the countries in the sample which does not allow us to estimate using our PMG method.

**Table D: Data Description and Sources**

Variable	Description	Source
Income per capita	Data measured as log real GDP per capita (chain weighted method, income measured in constant USD) from Penn World Tables 6.3.	<a href="http://pwt.econ.upenn.edu/">http://pwt.econ.upenn.edu/</a>
Democracy	Polity IV index ranging from -10 for perfect autocracies to +10 for perfect democracies.	<a href="http://www.systemicpeace.org/polity/polity4.htm">http://www.systemicpeace.org/polity/polity4.htm</a>
Natural resource rents	Expressed in percent of GDP. Rents are measured as the market value of extracted material minus the average extraction cost. Natural resources include bauxite, coal, copper, forest, gold, iron, lead, lignite, natural gas, nickel, oil, phosphates, silver, tin and zinc.	<a href="http://go.worldbank.org/OV4R25M150">World Bank data: http://go.worldbank.org/OV4R25M150</a>
Resource and non-resource income shares	Resource income share is defined as the share of Mining and Quarrying in GDP. Non-resource income constitutes the rest.	United Nations Statistics Division National Accounts Database.

**Figure A: Country-Specific FMOLS Income Per Capita Coefficients,  
N=105**



Source: Authors' calculations.

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