Income and Democracy: Comment

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Acemoglu, Johnson, Robinson, and Yared (2008) document that the correlation between income per capita and democracy disappears when including time and country fixed effects. While their results are robust for the full sample, we find evidence for significant but heterogeneous effects of income on democracy: negative for former colonies, but positive for non-colonies. Within the sample of colonies we detect heterogeneous effects related to colonial history and early institutions. The zero mean effect estimated by Acemoglu et al. is consistent with effects of opposite sign in the different sub-samples. Our findings are robust to the use of alternative data and estimation techniques.
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In a widely cited and very influential article, Daron Acemoglu, Simon Johnson, James Robinson and Pierre Yared (2008), henceforth AJRY (2008), revisit the relationship between income per capita and democracy. Previous investigations had found a strong positive statistical association between income and democracy across countries. This was typically interpreted as evidence in favor of Lipset's (1959) "Modernization Hypothesis". AJRY (2008) estimate the linear relationship between income and democracy by exploiting within-country variation over time and find that the positive association between income and democracy disappears in data for the post-war period, 1960 to 2000, once country and time fixed effects are explicitly accounted for. Their rather precise point estimate of zero is robust to extensive robustness checks.

The main hypothesis underlying the analysis by AJRY (2008) is that cross-sectional correlations might conceal important systematic differences across countries that affect both income and democracy since countries may "embark on divergent political and economic development paths, some leading to relative prosperity and democracy, others to relative poverty and dictatorship" (p. 812). The

inclusion of country fixed effects accounts for the omitted variable bias due to the existence of country-specific time invariant factors that jointly affect income and democracy. As example of such a factor AJRY (2008) emphasize the institutions that emerge at critical junctures in the history of a country, for example during colonization. In particular, "... differences in European colonization strategies have been a major determinant of the divergent development paths of colonial societies. This reasoning suggests that in this sample, the critical juncture for most societies corresponds to their experience under European colonization." (p. 813).[1]

The analysis of AJRY (2008) is based on an extension of the cross-sectional linear regression framework, that estimates the main effect at the sample mean, to the inclusion of country and time fixed effects. In this paper we extend the linear estimation framework to investigate whether the relevant (time invariant) country-specific heterogeneity (e.g., colonial history or institutions) affects democracy only in terms of the (average) variation in democracy (that is, the different intercepts of the regression line as picked up by the country fixed effects) or also in terms of different effects of income on changes of democracy (that is, in terms of the slope of the income effect).

Our analysis proceeds in three steps. First, we replicate the analysis for the full sample and find that the, rather precise, point estimate of zero found by AJRY (2008) is robust. Second, we investigate if the effect of income on democracy is heterogenous depending on whether a country has ever been colonized or not. Third, we investigate if the effect of income on democracy is heterogenous within the sample of colonies, depending on the colonization strategy and the corresponding quality of early institutions in a country, as proxied by, e.g., the existence of constraints on the executive in 1900 or the year of independence. The results reveal substantial heterogeneity in the effect of income on democracy across former colonies and non-colonies. The effect of income on democracy is positive in countries that have never been colonized, but negative in former colonies. Within colonies, the effect of income is also heterogenous and more negative in countries that were exposed to more extractive colonization strategies and worse institutions. The results are confirmed by extensive robustness checks.[2]

The findings have several relevant implications. First, the analysis is conducted

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[1]AJRY (2008) provide indirect support for this view by showing that the association between income and democracy is substantially weakened once accounting for a country's colonial history (in terms of, e.g., the year of independence) or for proxies of early institutions like the constraints on the executive in 1900, instead of country fixed effects.

[2]The results hold up with alternative data for democracy and income, different colony codings and data frequencies, and when using alternative empirical strategies that account for potential biases. These include the robustness checks by AJRY (2008) in terms of GMM estimators, IV strategies and GMM-IV, as well as Tobit models, bias-corrected estimators, or non-linear specifications of the income effect. The results are robust to the consideration of transitions to and away from democracy (see the companion paper by AJRY, 2009), different samples (excluding e.g. socialist, Muslim and oil countries) and to the inclusion of additional covariates (like education and population controls). Similar results are obtained with alternative data on colonial history and institutions, while no interactions with other variables are found to be relevant.

by allowing for a heterogeneous effect of income on democracy. The empirical analysis nests the linear empirical framework by AJRY (2008) as a special case, which is obtained if the effect of income on democracy is not heterogeneous across countries. The empirical results also document that the effect of income on democracy is significantly heterogeneous in the subsamples. The effect is opposite in sign for colonies and non-colonies, significantly different from zero (which is the point estimate obtained when constraining the effect to be homogeneous), and relevant in magnitude. The analysis therefore contributes novel evidence of substantially heterogeneous effects of income on democracy in different countries. The results show that the negative effect of income on democracy in former colonies, which is in line with some of the findings by AJRY (2009), is robust. The findings also uncover, however, that the effect for non-colonies is positive, significant, and quantitatively large. Finally, the results show that there are sizable heterogeneous effects within the sample of former colonies.

Second, the existence of a heterogenous effect of income implies that the results obtained with a linear framework (and in particular the finding of a zero effect) may be unstable given that they reflect sample composition. The heterogeneity in the income effect implies that the results obtained with linear regressions can be misleading since the point estimates can range from significantly positive to significantly negative, depending on the countries that are included in the estimation sample.[3]

Finally, the analysis highlights an aspect of colonial history and early institutions that appears crucial for the relationship between income and democracy but that is more subtle than previously thought and that has not been pointed out in the existing literature. The findings therefore suggest some fruitful directions for future research since interpreting these patterns requires an explanation that can account for the heterogeneous relationship between income and democracy in the different sub-samples.[4]

I. Econometric Specification and Data

The benchmark empirical specification follows AJRY (2008) and is given by

$$(1) \qquad d_{i,t} = \alpha d_{i,t-1} + \gamma y_{i,t-1} + \delta_i + \mu_t + u_{i,t} \,,$$

where $d_{i,t}$ is the democracy score of country i at time t. This dynamic empirical model captures persistence as well as mean-reverting dynamics by including the influence of the lagged value of the dependent variable $d_{i,t-1}$ in terms of the

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[3]The existence of a heterogeneous effect of income on democracy and the crucial role of sample composition can contribute to explaining the mixed findings that have been reported in the recent literature, like Benhabib, Corvalan, and Spiegel (2013) and Moral-Benito and Bartolucci (2012), that challenges the results of AJRY (2008).

[4]Alternative arguments with opposite predictions, like the modernization hypothesis or the existence of a temporary window of opportunity, have been proposed in the literature (see Cervellati et al., 2012, for a more detailed discussion of these issues). To our knowledge, however, no compelling theory is currently available that can jointly account for the heterogeneous effects in the different sub-samples.

coefficient α. The coefficient of main interest is γ and reflects the effect of the lagged value of log income per capita $y_{i,t-1}$ on democracy. The specification includes a full set of country fixed effects δ_i and time dummies μ_t.[5] Additional transitory shocks to democracy and other omitted factors are captured in the error term $u_{i,t}$.

To account for heterogeneous effects of income on democracy, the model (1) is extended by allowing income per capita to have different effects on democracy in different groups of countries, by considering the (partially) interacted model,

$$(2) \qquad d_{i,t} = \alpha d_{i,t-1} + \gamma y_{i,t-1} + \phi(y_{i,t-1} \cdot c_i) + \delta_i + \mu_t + u_{i,t} \,,$$

where the variable c_i denotes a time invariant country specific feature.[6] In section II.A, we estimate the model (2) with c_i indicating whether a country is a former colony or not. The empirical model estimated by AJRY (2008), (1), is nested in model (2). Both models exactly coincide if $\phi = 0$, that is, if the effect of income on democracy does not depend on the variable c_i. The specification (2) therefore allows for the estimation of a distinct effect of income on democracy in countries with $c_i = 1$, as reflected by ϕ. The partially interacted model (2) allows for an efficient estimation by exploiting variation for the full sample and allowing the effect of income to be heterogenous across countries with different institutional features, c_i, while maintaining the assumption that all other coefficients are the same across all countries. This assumption is not necessarily justified across the different sub-samples, however. Estimating a fully interacted model, i.e., estimating the empirical model (1) separately for different groups of countries, is a more flexible but less efficient strategy, since it allows for the possibility of heterogeneous convergence processes and development dynamics (in terms of coefficients α and δ), but involves estimating a larger number of parameters. In section II.A we also explore the existence of a heterogenous effect of income on democracy by estimating the empirical model (1) for the two sub-samples of former colonies and non-colonies. The results for the sample of colonies serve as benchmark to investigate the existence of heterogenous effects also within the sample of former colonies using the empirical model (2), which is done in Section II.B. In this analysis, c_i represents an indicator that proxies the heterogeneity in institutional features across colonies.[7]

The empirical analysis is based on five-year and ten-year panel data sets over the period 1960-2000 compiled by AJRY (2008).[8] As benchmark index of democracy

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[5] As in AJRY (2008), we include additional covariates, $x'_{i,t-1}\beta$, in some specifications.

[6] The main effect of the time invariant interaction c_i in specification (2) is subsumed in the country fixed effect.

[7] Also for the sub-sample of colonies the variable c_i is not relevant for the effect of income on democracy under the null hypothesis, implying that the results of the two models would coincide.

[8] The analysis concentrates on the time after 1960 because of serious data limitations for former colonies before 1960. Data are only available for very few colonies before 1960, and the sample becomes increasingly biased towards particular groups of colonies when going back in time, which is not appropriate for the purposes of this study. In addition, a comparison of former colonies and non-colonies

we use the data provided by Freedom House normalized to range from 0 to 1, with higher values indicating higher values of democracy. The primary source for data on GDP per capita is the Penn World Tables. Information on whether a country was a former colony is taken from the *French Center for Research and Studies on the World Economy* (CEPII) database, which has the advantage of providing a complete classification of colonial status for all countries in the sample. The data on constraints on the executive in 1900 are from Acemoglu, Johnson and Robinson (2001), information on the year of independence is from AJRY (2008), and information on the last colonial power before independence is from the CIA World Fact Book and from CEPII. See the Online Appendix for a detailed description of the data sources, including the data sources for the various robustness checks.

II. Analysis and Results

Figure 1(a) illustrates the positive correlation between income and democracy in the absence of country fixed effects. Figure 1(b) plots the correlation when exploiting within-country variation in the data.[9] The figure provides an illustration of the findings by AJRY (2008) and documents their main result: the effect of income on democracy in the full sample disappears once time invariant country-specific factors are included in the estimation framework. Income per capita is not related to democracy once country and time fixed effects are included. Figure 1(c) provides a graphical illustration of the results obtained when replicating the analysis by allowing for heterogeneous effects in terms of a separate estimation of specification (1) for the sub-samples of former colonies and non-colonies, respectively. Figure 1(d) shows the results from the same estimates of a specification (1) for the sample of non-colonies and colonies, but where the income effect is allowed to differ across former colonies without and with constraints on the executive in 1900. The figures illustrate a heterogeneous effect of income on democracy across non-colonies and former colonies, as well as within colonies. The following analysis provides a systematic investigation of these patterns.

A. The Effect of Income in Non-Colonies and Colonies

Table 1 presents the results from estimating model (1) with data from the entire sample of countries over the period 1960 to 2000 using the Freedom House measure of democracy. Column (1) replicates the results of AJRY (2008) using their data, sample and specification in the five-year panel. The results deliver a

becomes increasingly problematic for the period before 1960 due to the ongoing colonial domination in many countries in this period. See also the discussion in AJRY (2008) about the inconsistency of the fixed effects estimator if relevant country specific characteristics (like e.g. institutions) emerge during the observation period.

[9]The graph depicts the predicted effect of income on democracy, net of past democracy, year fixed effects and country fixed effects in a cross-country panel 1960-2000 with five-year frequency. This is the effect that is obtained estimating the empirical model (1) for the full sample. Corresponding estimation results are reported in Table 1 below.
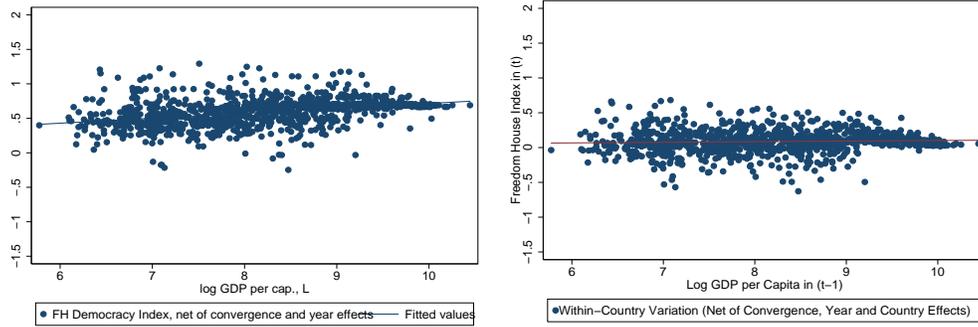
(a) Replication AJRY, Full Sample, No Fixed Effects

(b) Replication AJRY, Full Sample, Fixed Effects
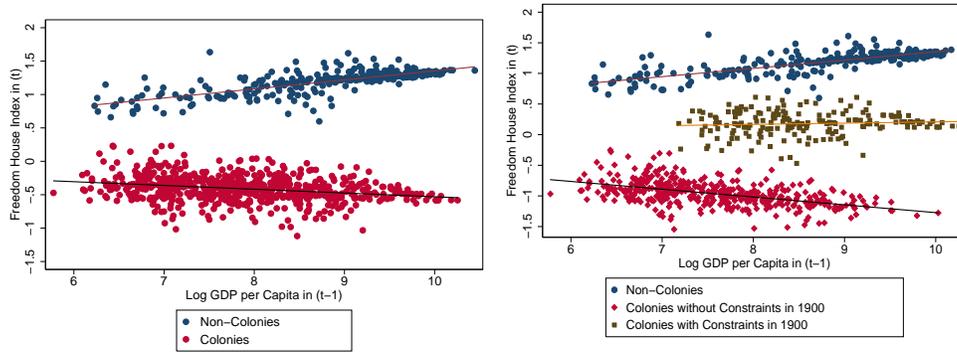
(c) Non-Colonies and Colonies, Fixed Effects

(d) Non-Colonies and Colonies With and Without Constraints on the Executive 1900, Fixed Effects

FIGURE 1. WITHIN COUNTRY VARIATION, HETEROGENEOUS EFFECTS OF INCOME ON DEMOCRACY

rather precise estimate of a zero effect of log income per capita (in period $t-1$) on democracy (in period t) and document that their findings for the full sample are robust. Past democracy, on the other hand, has a highly significant effect on present democracy. Column (3) presents the same result for the ten-year panel. In this specification, income has no significant effect on democracy, and even the significant effect of past democracy vanishes.

Columns (2) and (4) of Table 1, report the results from estimating the model (2), where c_i is a binary indicator variable that takes value 1 if a country is a former colony, and 0 if a country has never been colonized (using the colony coding in the CEPII data). Recall that the empirical specification (2) nests the baseline specification of AJRY (2008) as a special case, which is obtained if the effect of income on democracy is homogenous. The findings reject the null hypothesis of a homogenous effect of income across those countries that were, and those that were not, subject to foreign colonial rule. The results document a significant

TABLE 1—INCOME AND DEMOCRACY: REPLICATION AND BASELINE RESULTS

Dependent Variable	Democracy (Freedom House)			
	(1)	(2)	(3)	(4)
Democracy$_{t-1}$	0.379***	0.363***	-0.025	-0.069
	[0.047]	[0.044]	[0.075]	[0.065]
Income$_{t-1}$	0.010	0.080**	0.053	0.190***
	[0.032]	[0.039]	[0.056]	[0.070]
Income$_{t-1}$ × Colony		-0.118***		-0.247***
		[0.042]		[0.067]
Panel	5-years	5-years	10-years	10-years
Observations	945	945	457	457
Countries	150	150	127	127
Adj. R^2	0.234	0.242	0.110	0.153

Note: Fixed-effect OLS. Panel regressions with clustered standard errors in brackets. ***, **,* indicate significance at 1-, 5-, and 10-percent level, respectively. All regressions include country fixed effects and time fixed effects. The results in column (1) replicate those in AJRY (2008), Table 2 Col. (2). Results in column (3) replicate those in AJRY (2008), Table 2 Col. (7). Colony coding from the CEPII data set.

and positive effect of income on democracy for non-colonies and a significant negative interaction effect for colonies. The negative interaction effect is larger in size than the main effect, suggesting that income indeed affects democracy significantly positively in countries that have never been colonized, whereas the effect is negative (but statistically insignificant) for former colonies.[10] The pattern is similar for the ten-year panel with point estimates being about twice as large, see column (4).

Table 2 presents the results from estimating the empirical model (1) separately for the samples of former colonies and non-colonies. The table reports estimates obtained with both the full sample (using all available data) and for fully balanced panels, which represent the most restrictive samples.[11] The results confirm the finding that income has a significant positive effect on democracy in countries that have never been colonized. The results show a significant negative effect of income on democracies in former colonies.[12] This also implies that the effects are significantly different from each other for non-colonies and colonies.

In the ten-year panel, there is little evidence of persistence in democracy for either group of countries, and the effect of income on democracy (positive in the sample of non-colonies and negative in the sample of colonies) is larger in terms

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[10]Notice that the total effect of income on democracy for former colonies is given by the sum of the coefficients on the income variable and on the interaction variable.

[11]The fully balanced sample restriction is identical to that made by AJRY (2008).

[12]A significant negative effect has already been found by AJRY(2009) using the Freedom House measure of democracy in a restricted sample of colonies (in Column (2) Panel A of Table 6 page 1056). As discussed in more details also below, the results of Table 2 show that the finding of a significant negative effect in colonies is actually robust to different measures of democracy, and consistently emerges with different estimation techniques and samples.

TABLE 2—INCOME AND DEMOCRACY IN NON-COLONIES AND COLONIES

Dep. Variable	Democracy (Freedom House)			
	Panel (A): Non-Colonies			
	(1)	(2)	(3)	(4)
Democracy$_{t-1}$	0.587***	0.428***	0.212	-0.049
	[0.108]	[0.111]	[0.137]	[0.146]
Income$_{t-1}$	0.172***	0.214***	0.490***	0.492***
	[0.045]	[0.057]	[0.109]	[0.129]
Panel	Full	Balanced	Full	Balanced
	5-years	5-years	10-years	10-years
Observations	251	161	113	69
Countries	44	23	27	23
Adj. R^2	0.476	0.426	0.46	0.443
	Panel (B): Colonies			
	(1)	(2)	(3)	(4)
Democracy$_{t-1}$	0.330***	0.225***	-0.119*	-0.129
	[0.049]	[0.060]	[0.067]	[0.089]
Income$_{t-1}$	-0.063*	-0.102**	-0.090*	-0.143**
	[0.033]	[0.048]	[0.047]	[0.070]
Panel	Full	Balanced	Full	Balanced
	5-years	5-years	10-years	10-years
Observations	737	469	352	228
Countries	106	67	100	76
Adj. R^2	0.203	0.174	0.115	0.101

Note: Fixed-effect OLS panel regressions with clustered standard errors in brackets. ***, **,* indicate significance at 1-, 5-, and 10-percent level, respectively. All regressions include country fixed effects and time fixed effects. The coding of colonies is according to the CEPII data set.

of absolute magnitude, consistent with the baseline results of Table 1.

The results also document significantly different effects of past democracy on current democracy in the two sub-samples, suggesting that the partially inter-acted model is overly restrictive. In both cases, past democracy has a positive effect on current democracy, but the persistence in democratic quality is sub-stantially larger in non-colonies than in colonies in the five-year panel, which provides additional evidence for heterogeneous development patterns in colonies and non-colonies that is reflected in different persistence of democracy.[13]

Due to the inclusion of the lagged dependent variable in a fixed effects frame-work, the estimates of the effect of income on democracy are potentially biased (Nickell, 1981). This problem can be relevant if the number of time-series obser-

[13]The results also reveal significant differences in the dynamics, reflected by period dummies, δ_t, across former colonies and non-colonies. Details are available upon request.

vations is small. The resulting bias is unlikely to be the driving factor behind the finding of a heterogenous effect in non-colonies and colonies, however, since there is no reason why this statistical bias should vary across different samples of countries, and hence drive the finding of a heterogeneous effect of income on democracy. Nevertheless, we apply alternative estimation methods, including the ones that have been adopted by AJRY (2008), to mitigate potential concerns regarding biased estimates in dynamic panels with fixed effects.

A first strategy involves using GMM estimators along the line of AJRY (2008). The corresponding estimates are consistent although they critically depend on the identification assumptions and the strength of past levels as instruments for the change in democracy.[14] The properties of the GMM estimator require the cross-section dimension of the panel to be sufficiently large. A small cross-section dimension imposes constraints on the number of instruments that can effectively be used. To limit problems of instrument proliferation, we follow the best practice of adopting parsimonious specifications that pass the specification tests using the minimal number of instruments.[15] Table 3 shows that the main result that the income effect is positive for the sample of non-colonies but negative for the sample of colonies is confirmed. The estimates for the persistence term α are similar to those obtained with fixed effects, while the heterogeneity of the income effect is slightly more pronounced in the GMM estimates.

AJRY (2008) also present instrumental variables estimates that rely on exogenous sources of variation and thus account for potential concerns about reverse causality. Their main instrumentation strategy exploits trade linkages across countries that induce the transmission of variations in income from the rest of the world to a particular country under consideration.[16] Table 3 also presents the results of the outcome equation when instrumenting lagged income per capita using the trade weighted world income instrument. The instrument is weak in terms of first stage performance for the set of non-colonies and the estimates of

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[14]AJRY (2008) estimate difference GMM models along Arellano and Bond (1991), but refrain from using system GMM because the time-differenced instruments that are used for the level equation in the system estimation are unlikely to be orthogonal to the country fixed effects. For this to be satisfied (and the estimator to be valid), it is effectively required that all countries are in steady state, which is not the case. In fact, while we still obtain evidence for a heterogenous income effect on democracy when estimating system GMM models, the specification tests reject the validity of the additional instruments in these models.

[15]If the number of instruments is too large, the estimator may fail to expunge the endogenous component of the instrumented regressor. A rule of thumb for the maximal number of instruments is conventionally taken to be the number of cross-sectional units, see Roodman (2009). The specifications shown here make use of two and three lags of democracy as instruments, which keeps the number of instruments sufficiently small.

[16]The trade-weighted level of income in the rest of the world should therefore be a suitable instrument for the income in a particular country, since it affects the level of income through the transmission channel, while being plausibly exogenous to the level of democracy in the country conditional on the other controls. AJRY (2008) also consider lagged savings rates as a further instrument for income changes even though they point out that there is no strong reason to believe that this variable satisfies the conditions for an instrument, which is why we focus attention on the world income instrument as benchmark. Results with the savings instrument are qualitatively similar although the instrument does not perform as well as the trade-weighted income.

TABLE 3—INCOME AND DEMOCRACY IN NON-COLONIES AND COLONIES: GMM AND IV

Dep. Variable	Democracy (Freedom House)			
	Panel (A): Non-Colonies			
	GMM		IV	GMM-IV
	(1)	(2)	(3)	(4)
Democracy$_{t-1}$	0.681***	0.369*	0.322	0.589**
	[0.254]	[0.212]	[4.979]	[0.256]
Income$_{t-1}$	0.506*	0.443**	1.367	0.469
	[0.278]	[0.217]	[23.027]	[0.361]
Panel	5-years	10-years	5-years	5-years
Observations	207	86	218	192
Countries	27	26	26	25
Adj. R^2				
Instruments	25	15		25
Hansen J Test	0.262	0.268		0.329
AR(2) Test	0.784	0.497		0.566
Lags Int. IV	2/3	All		2/3
First Stage F			0	

	Panel (B): Colonies			
	GMM		IV	GMM-IV
	(1)	(2)	(3)	(4)
Democracy$_{t-1}$	0.401***	0.026	0.334***	0.431***
	[0.105]	[0.139]	[0.049]	[0.113]
Income$_{t-1}$	-0.231**	-0.487*	-0.160**	-0.180*
	[0.112]	[0.284]	[0.071]	[0.101]
Panel	5-years	10-years	5-years	5-years
Observations	631	252	718	620
Countries	100	92	98	97
Adj. R^2				
Instruments	55	12		55
Hansen J Test	0.25	0.162		0.174
AR(2) Test	0.605	0.209		0.498
Lags Int. IV	All	1/2		All
First Stage F			57.59	

Note: Difference GMM estimates with robust standard errors clustered at the country level in brackets. ***, **,* indicate significance at 1-, 5-, and 10-percent level, respectively. All regressions include time fixed effects. Colony coding from the CEPII data set.

the effects in the outcome equation are therefore not reliable.[17] For the sample

[17]Additional unreported results that were obtained for a reduced sample that drops all country-year observations with a democracy index of 1 (censored observations) delivers a considerably stronger first stage performance of the instrument with an F-statistic of 24 and a positive income effect of 0.281 [s.e. 0.161] on the second stage.

of former colonies the instrument works well, with an F-statistic substantially exceeding the conventional critical value. The IV results confirm the findings of a negative and significant effect of income on democracy in the sample of former colonies. Finally, Table 3 presents the results of GMM estimations when instrumenting lagged income using the trade weighted world income instrument. Again the results for the non-colonies essentially collapse to the findings obtained without instrumentation. The instrumentation works better for the colony sample. The findings confirm that the effect of income on democracy is negative, and slightly stronger in magnitude compared to the OLS estimates. In terms of the size of the effects, GMM and IV methods deliver slightly larger coefficient estimates in absolute terms. This suggests that, if anything, the fixed effects estimates reveal lower heterogeneity across colonies and non-colonies than what is found using these more refined estimation methods.

B. The Effect of Income on Democracy within Colonies

Estimating the empirical model (2) allows investigating whether the effect of income on democracies is heterogenous also within colonies depending on the quality of (early) institutions. For comparability with the results reported in Table 2, and to facilitate the interpretation of the quantitative effects, we consider a dummy variable c_i that takes value 0 if a country had historically weak institutions and value 1 if the country had strong institutions. As a first proxy for institutional quality we use the level of constraints on the executive in 1900 which is used by Acemoglu, Johnson and Robinson (2001). Alternatively, we use information whether a country became independent before 1900 under the premise "non-extractive colonies gained their independence typically earlier than the extractive ones" (Acemoglu et al., 2009, p. 1046). A third proxy uses information on whether a colony was subject to the rule of the late colonial powers in view of the literature that suggests that the rule of the late colonial powers exhibited more extractive institutions.[18] As before, the specification nests the linear model (1) as a special case. Under the null hypothesis that different institutional backgrounds do not matter for the effect of income on democracy after 1960, the estimates should coincide with those reported in Table 2.

Table 4 presents the results for five-year and ten-year panels. The findings in Columns (1) and (2) document a significant heterogeneity in the effect of income on democracy in colonies, depending on the constraints on the executive in 1900. In countries with no constraints, the effect of income on democracy is significantly negative and about twice as large as the respective average effect documented in Table 2. The effect of income is significantly more positive in countries with some constraints on the executive in 1900 (as reflected by the positive coefficient

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[18]The analysis is conducted using a dummy variable that takes value 0 if, before independence, a country was subject to the colonization of the U.K., France and Belgium, and 1 otherwise. See Cervellati et al. (2012) for a discussion of the further alternative proxies for early institutions that have been proposed in the literature.

TABLE 4—INCOME AND DEMOCRACY WITHIN COLONIES: ROBUSTNESS

Dep. Variable	Democracy (Freedom House)					
c_i	Constraints on the Executive in 1900		Independence before 1900		No Late Colonial Power	
	Panel A: Fixed Effects					
	(1)	(2)	(3)	(4)	(5)	(6)
Democracy$_{t-1}$	0.288***	-0.156**	0.319***	-0.132*	0.327***	-0.120*
	[0.053]	[0.071]	[0.049]	[0.068]	[0.049]	[0.068]
Income$_{t-1}$	-0.127***	-0.154***	-0.077**	-0.108**	-0.098***	-0.146***
	[0.036]	[0.058]	[0.034]	[0.050]	[0.034]	[0.054]
Income$_{t-1}\times c_i$	0.148**	0.164*	0.113*	0.143*	0.123**	0.213***
	[0.070]	[0.087]	[0.060]	[0.078]	[0.053]	[0.074]
Panel	5-years	10-years	5-years	10-years	5-years	10-years
Observations	610	295	733	350	737	352
Countries	79	79	105	99	106	100
Adjusted R^2	0.194	0.12	0.201	0.12	0.209	0.134
	Panel B: GMM					
	(1)	(2)	(3)	(4)	(5)	(6)
Democracy$_{t-1}$	0.289**	-0.058	0.343***	0.095	0.355***	0.084
	[0.123]	[0.132]	[0.110]	[0.139]	[0.101]	[0.125]
Income$_{t-1}$	-0.417**	-0.716**	-0.270**	-0.185	-0.303***	-0.332
	[0.194]	[0.364]	[0.113]	[0.175]	[0.110]	[0.203]
Income$_{t-1}\times c_i$	0.345**	0.387*	0.224*	0.157	0.318***	0.387**
	[0.162]	[0.213]	[0.121]	[0.185]	[0.122]	[0.170]
Panel	5-years	10-years	5-years	10-years	5-years	10-years
Observations	531	216	628	251	631	252
Countries	79	75	99	91	100	92
Instruments	56	16	56	16	56	16
Hansen J Test	0.168	0.084	0.285	0.011	0.438	0.072
AR(2) Test	0.805	0.097	0.663	0.671	0.674	0.748
Lags Int. IV's	All	All	All	All	All	All

Note: Panel A: Fixed-effect OLS regressions with clustered standard errors in brackets. Panel B: Difference GMM estimates with robust standard errors in brackets. ***, **,* indicate significance at 1-, 5-, and 10-percent level, respectively. All regressions include country fixed effects and time fixed effects. Colony coding from the CEPII data set.

for the interaction term), with the total effect of income on democracy being essentially zero. The pattern is qualitatively identical and quantitatively similar when distinguishing between colonies that became independent before and after 1900 as shown in Columns (3) and (4), and when using information on whether a colony was subject to the rule of the late colonial powers, as shown in Columns

(5) and (6). The results obtained with GMM are similar, with the coefficient estimates being slightly larger than the respective results of Table 3.

C. *Discussion and Robustness of the Results*

The results document a significant heterogeneity in the effect of income on democracy, both across former colonies and non-colonies, and within the sample of former colonies, depending on their institutions and colonial history. The estimated effects of income on democracy are quantitatively sizable. For the sample of non-colonies, the income coefficient in Tables 1 and 2 ranges from 0.08 to 0.21 in the five-year panels, and from around 0.19 to 0.5 in the ten-year panels. These effects reflect the change in the democracy index (which ranges from 0 to 1) that corresponds to a log-difference in income of 1.[19] The short-term effect for colonies is also sizable and ranges from -0.06 to -0.14 and -0.09 to -0.15, respectively, for the five-year and ten-year panels. The observed changes in income are therefore associated with substantial, but heterogenous, changes in democracy.[20]

The robustness of the findings is documented in the Online Appendix. The robustness checks include the use of alternative measures of democracy (like the Polity IV or binary measures of democracy), alternative colony codings (like the coding used by AJRY, 2008, that is available only for a smaller number of countries, and the Quality of Governance classification), alternative income data, and the estimation of Tobit models to allow for censoring. The robustness results also show that the heterogeneity of the income effect is related to colonial status and is not driven by heterogeneity in income or non-linear effects of income on democracy. The heterogeneous effect is also not due to heterogeneity in the quality of democracy or asymmetric effects of changes to and from non-democracy and democracy. The results are robust to excluding muslim, (former) socialist, oil exporting, middle-east and Western European countries and to the inclusion of average years of schooling, population, median age and labor share of gross value added as additional controls. Similar results within colonies are obtained using alternative proxies of institutions and colonial history (like the population share of European descent and the year of colonization) while no further interactions (like the share of land in the tropics, the percentage of arable land and the Africa dummy) are found to be significant.

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[19]For instance, the average increase in log income per capita in the sample of non-colonies over the sample period 1960 to 2000 was approximately 1.2. This corresponds to an increase in absolute income per capita of more than 200%. The variation across non-colonies at a given point in time (e.g., in 1960 or 2000) exceeded 3.

[20]The corresponding long-term effects for non-colonies range from 0.12 to 0.42 and from 0.17 to 0.62, respectively, in the five-year and ten-year panels. The long-term effects for colonies range from -0.06 to -0.13 and from -0.05 to -0.13, respectively, in the five-year and ten-year panels. The effects obtained with GMM and IV reported in Table 3 are even larger.

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