The Political Economy of Heterogeneous Development: Quantile Effects of Income and Education*

Marcus Alexander†, Matthew Harding‡ and Carlos Lamarche§

November 2008

Online Appendix

Abstract

Does development lead to the establishment of more democratic institutions? The key to the puzzle, we argue, is the previously unrecognized fact that based on quantitative regime scores, countries over the past 50 years have clustered into two separate, very distinct, yet equally-common stages of political development — authoritarian states with low levels of freedom on one side and democracies with liberal institutions on the other side of a bimodal distribution of political regimes. We develop a new empirical strategy — exploiting exogenous world economic factors and introducing new panel data estimators — that allows for the first time to estimate the effects of development as well as unobserved country effects in driving democracy at these different stages of political development. We find that income and education have the least effect on democracy when authoritarian regimes are consolidated and that only country effects, possibly accounting for institutional legacies, can lead to political development. Ironically, it is in highly democratic and wealthiest of nations that income and education start to play a role; however greater wealth and better educated citizenry can both help and hurt democracy depending again on what the country's institutional legacies are. Far from accepting the notion that much of the developing world is cursed by unchanging and poor long-run institutions, policy-makers should take note that with democratization we also see country-specific factors that in turn condition the difference income and education make for democracy.

JEL: C13, C23, P16, O10
Keywords: democracy, economic development, quantile regression

*We are grateful to Tim Hyde for excellent research assistance. We are grateful to Robert Bates, Victor Chernozhukov, Jorge Dominguez, Dawn Brancati, Margarita Estavez-Abe, Kevin Grier, Yoshiko Herrera, Nahomi Ichino, Torben Iversen, Gary King, Roderick MacFarquhar, Thomas Remington, James Robinson and seminar participants at Harvard and Stanford for useful comments, and to Daron Acemoglu, James Robinson, Simon Johnson and Pierre Yared for sharing their historical data.

†Institute for Quantitative Social Science, Harvard University, 1737 Cambridge Street, Cambridge, MA 02138; Email: malexand@fas.harvard.edu

‡Department of Economics, Stanford University, 579 Serra Mall, Stanford, CA 94305; Phone: (650) 723-4116; Fax: (650) 725-5702; Email: mch@stanford.edu

§Department of Economics, University of Oklahoma, 729 Elm Avenue, Norman, OK 73019; Phone: (405) 325-5857; Email: lamarche@ou.edu

Country		Obs	From	To	Country		Obs	From	To
Afghanistan	AFG	55	1945	1999	Dominican Rep.	DOM	55	1945	1999
Albania	ALB	55	1945	1999	Ecuador	ECU	55	1945	1999
Algeria	DZA	38	1962	1999	Egypt	EGY	55	1945	1999
Angola	AGO	25	1975	1999	El Salvador	SLV	55	1945	1999
Argentina	ARG	55	1945	1999	Eritrea	ERI	7	1993	1999
Armenia	ARM	9	1991	1999	Estonia	EST	9	1991	1999
Australia	AUS	55	1945	1999	Ethiopia	ETH	55	1945	1999
Austria	AUT	55	1945	1999	Fiji	FJI	30	1970	1999
Azerbaijan	AZE	9	1991	1999	Finland	FIN	55	1945	1999
Bahrain	BHR	29	1971	1999	France	FRA	55	1945	1999
Bangladesh	BGD	28	1972	1999	Gabon	GAB	40	1960	1999
Belarus	BLR	9	1991	1999	Gambia	GMB	35	1965	1999
Belgium	BEL	55	1945	1999	Georgia	GEO	9	1991	1999
Benin	BEN	40	1960	1999	Germany, Dem. Rep.	DEE	42	1949	1990
Bhutan	BTN	29	1971	1999	Germany, Fed. Rep.	DEW	55	1945	1999
Bolivia	BOL	55	1945	1999	Ghana	GHA	43	1957	1999
Bosnia	BIH	8	1992	1999	Greece	GRC	55	1945	1999
Botswana	BWA	34	1966	1999	Guatemala	GTM	55	1945	1999
Brazil	BRA	55	1945	1999	Guinea	GIN	42	1958	1999
Bulgaria	BGR	55	1945	1999	Guinea Bissau	GNB	26	1974	1999
Burkina Faso	BFA	40	1960	1999	Guyana	GUY	34	1966	1999
Burma	BRM	52	1948	1999	Haiti	HTI	55	1945	1999
Burundi	BDI	38	1962	1999	Honduras	HND	55	1945	1999
Cambodia	KHM	47	1953	1999	Hungary	HUN	55	1945	1999
Cameroon	CMR	40	1960	1999	India	IND	53	1947	1999
Canada	CAN	55	1945	1999	Indonesia	IDN	51	1949	1999
Central African Rep.	CAF	40	1960	1999	Iran	IRN	55	1945	1999
Chad	TCD	40	1960	1999	Iraq	IRQ	55	1945	1999
Chile	CHL	55	1945	1999	Ireland	IRL	55	1945	1999
China	CHN	55	1945	1999	Israel	ISR	52	1948	1999
Colombia	COL	55	1945	1999	Italy	ITA	55	1945	1999
Congo	ZAR	40	1960	1999	Ivory Coast	CIV	40	1960	1999
Costa Rica	CRI	55	1945	1999	Jamaica	JAM	38	1962	1999
Croatia	HRV	8	1992	1999	Japan	JPN	55	1945	1999
Cuba	CUB	55	1945	1999	Jordan	JOR	54	1946	1999
Cyprus	CYP	40	1960	1999	Kazakhstan	KAZ	9	1991	1999
Czechoslovakia	CZV	48	1945	1992	Kenya	KEN	37	1963	1999
Czech, Rep	CZE	7	1993	1999	S. Korea	PPK	51	1949	1999
Congo, Dem. Rep.	COG	40	1960	1999	Kuwait	KWT	39	1961	1999
Denmark	DNK	55	1945	1999	Kyrgyzstan	KGZ	9	1991	1999
Djibouti	DJI	23	1977	1999	Laos	LAO	47	1953	1999

TABLE 1. Sample of Countries.

Country		Obs	From	To	Country		Obs	From	To
Latvia	LVA	9	1991	1999	Sierra Leone	SLE	39	1961	1999
Lebanon	LBN	54	1946	1999	Singapore	SGP	35	1965	1999
Lesotho	LSO	34	1966	1999	Slovakia	SVK	7	1993	1999
Liberia	LBR	55	1945	1999	Slovenia	SVN	8	1992	1999
Libya	LBY	49	1951	1999	Somalia	SOM	40	1960	1999
Lithuania	LTU	9	1991	1999	South Africa	ZAF	55	1945	1999
Macedonia	MKD	7	1993	1999	Spain	ESP	55	1945	1999
Madagascar	MDG	40	1960	1999	Sri Lanka	LKA	52	1948	1999
Malawi	MWI	36	1964	1999	Sudan	SDN	44	1956	1999
Malaysia	MYS	43	1957	1999	Swaziland	SWZ	32	1968	1999
Mali	MLI	40	1960	1999	Sweden	SWE	55	1945	1999
Mauritania	MRT	40	1960	1999	Switzerland	CHE	55	1945	1999
Mauritius	MUS	32	1968	1999	Syria	SYR	54	1946	1999
Mexico	MEX	55	1945	1999	Taiwan	TWN	51	1949	1999
Moldova	MDA	9	1991	1999	Tajikistan	TJK	9	1991	1999
Mongolia	MNG	55	1945	1999	Tanzania	TZA	39	1961	1999
Morocco	MAR	44	1956	1999	Thailand	THA	55	1945	1999
Mozambique	MOZ	25	1975	1999	Togo	TGO	40	1960	1999
N. Korea	KOR	52	1948	1999	Trinidad & Tobago	TTO	38	1962	1999
Namibia	NAM	10	1990	1999	Tunisia	TUN	44	1956	1999
Nepal	NPL	55	1945	1999	Turkey	TUR	55	1945	1999
Netherlands	NLD	55	1945	1999	Turkmenistan	TKM	9	1991	1999
New Zealand	NZL	55	1945	1999	United Arab Emirates	ARE	29	1971	1999
Nicaragua	NIC	55	1945	1999	Uganda	UGA	38	1962	1999
Niger	NER	40	1960	1999	UK	GBR	55	1945	1999
Nigeria	NGA	40	1960	1999	Ukraine	UKR	9	1991	1999
Norway	NOR	55	1945	1999	Uruguay	URY	55	1945	1999
Oman	OMN	29	1971	1999	USA	USA	55	1945	1999
Pakistan	PAK	53	1947	1999	Uzbekistan	UZB	9	1991	1999
Panama	PAN	55	1945	1999	Venezuela	VEN	55	1945	1999
Papua Nueva Guinea	PNG	25	1975	1999	Vietnam	VNM	46	1954	1999
Paraguay	PRY	55	1945	1999	Vietnam, S.	VNS	22	1954	1975
Peru	PER	55	1945	1999	Yemen	YEM	10	1990	1999
Philippines	PHL	54	1946	1999	Yemen, Arab. Rep.	YEA	46	1945	1990
Poland	POL	55	1945	1999	Yemen, Peop. Rep.	YEP	24	1967	1990
Portugal	PRT	55	1945	1999	Yugoslavia	YUG	55	1945	1999
Romania	ROM	55	1945	1999	Zambia	ZMB	36	1964	1999
Russia	RUS	55	1945	1999	Zimbabwe	ZWE	35	1965	1999
Rwanda	RWA	38	1962	1999					
Saudi Arabia	SAU	55	1945	1999					
Senegal	SEN	40	1960	1999					

TABLE 2. Sample of Countries (Cont.).

Variables	Quantiles					Mean
	0.10	0.25	0.50	0.75	0.90	
Polity Measure	Pooled Regressions					
Log GDP per Capita$_{it-1}$	0.092	0.246	0.278	0.158	0.059	0.227
	(0.011)	(0.012)	(0.010)	(0.019)	(0.005)	(0.014)
Log Population	-0.002	0.007	-0.005	-0.006	-0.004	0.002
	(0.003)	(0.003)	(0.004)	(0.003)	(0.001)	(0.016)
Polity Measure	Instrumental Variables					
Log GDP per Capita$_{it-1}$	0.000	0.000	0.147	0.290	0.000	0.145
	(0.071)	(0.047)	(0.059)	(0.122)	(0.393)	(0.049)
Log Population	0.000	0.000	-0.003	-0.008	0.000	0.002
	(0.007)	(0.009)	(0.010)	(0.015)	(0.006)	(0.007)
Polity Measure	Fixed Effects					
Log GDP per Capita$_{it-1}$	0.020	0.016	0.012	-0.012	-0.058	-0.023
	(0.030)	(0.029)	(0.030)	(0.029)	(0.035)	(0.032)
Log Population	0.086	0.089	0.088	0.088	0.090	0.074
	(0.040)	(0.040)	(0.039)	(0.039)	(0.038)	(0.061)
Freedom House Measure	Pooled Regressions					
Log GDP per Capita$_{it-1}$	0.193	0.302	0.269	0.199	0.091	0.234
	(0.012)	(0.012)	(0.010)	(0.011)	(0.010)	(0.012)
Log Population	0.002	-0.001	-0.012	-0.019	-0.009	-0.008
	(0.003)	(0.007)	(0.005)	(0.003)	(0.002)	(0.011)
Freedom House Measure	Instrumental Variables					
Log GDP per Capita$_{it-1}$	0.000	0.135	0.201	0.000	0.000	0.146
	(0.110)	(0.044)	(0.087)	(0.445)	(0.298)	(0.046)
Log Population	0.000	0.001	-0.017	0.000	0.000	-0.009
	(0.012)	(0.011)	(0.006)	(0.029)	(0.029)	(0.005)
Freedom House Measure	Fixed Effects					
Log GDP per Capita$_{it-1}$	0.103	0.092	0.070	0.036	0.005	0.016
	(0.039)	(0.034)	(0.033)	(0.034)	(0.036)	(0.030)
Log Population	-0.025	-0.013	-0.010	-0.009	-0.015	-0.103
	(0.032)	(0.031)	(0.031)	(0.030)	(0.030)	(0.059)

TABLE 3. Sensitivity analysis using the 5-year data in Acemoglu et. al. (2008). The instrument for income is trade weighted world income. Year effects are included in all the regressions. Standard errors in parenthesis.

Country	Educ	Income	Settler Mortality	Pop Density	Country	Educ	Income	Settler Mortality	Pop Density
AFG	Low	Low	M-High	M-Low	DOM	M-Low	M-Low	M-High	M-Low
ALB	-	Low	-	M-High	ECU	M-High	M-Low	M-Low	M-Low
DZA	Low	M-High	M-High	Low	EGY	M-Low	M-Low	Low	M-High
AGO	-	Low	High	M-Low	SLV	M-Low	M-Low	M-Low	M-Low
ARG	M-High	High	Low	Low	ERI	-	-	-	M-Low
ARM	-	M-High	-	M-High	EST	High	M-High	-	Low
AUS	High	High	Low	Low	ETH	Low	Low	Low	M-Low
AUT	High	High	-	High	FJI	M-High	M-High	Low	
AZE	-	M-Low	-	M-High	FIN	High	High	-	Low
BHR	M-Low	High	-	M-Low	FRA	M-High	High	Low	High
BGD	Low	M-Low	M-Low	High	GAB	-	M-High	High	M-Low
BLR	-	M-High	-	Low	GMB	Low	Low	High	M-High
BEL	High	High	-	High	GEO	-	M-Low	-	M-High
BEN	Low	M-Low	High	M-High	DEE	High	High	-	High
BTN	-	Low	-	-	DEW	High	High	-	High
BOL	M-High	M-Low	M-Low	Low	GHA	M-Low	Low	High	M-High
BIH	-	-	-	High	GRC	M-High	M-High	-	M-High
BWA	M-Low	M-Low	-	Low	GTM	Low	M-Low	M-Low	M-Low
BRA	M-Low	M-High	M-Low	Low	GIN	-	Low	High	M-High
BGR	High	M-Low	-	M-High	GNB	-	Low	M-High	M-High
BFA	-	Low	High	M-High	GUY	M-High	M-Low	Low	Low
BRM	Low	Low	Low	M-High	HTI	Low	Low	M-High	M-Low
BDI	Low	Low	High	High	HND	M-Low	M-Low	M-Low	M-Low
KHM	-	Low	-	High	HUN	High	M-High	-	High
CMR	Low	M-Low	High	M-Low	IND	M-Low	Low	Low	High
CAN	High	High	Low	Low	IDN	M-Low	M-Low	M-High	M-High
CAF	Low	Low	High	M-Low	IRN	Low	M-High	-	M-Low
TCD	-	Low	High	Low	IRQ	Low	M-High	-	M-Low
CHL	M-High	M-High	Low	Low	IRL	High	High	-	High
CHN	M-High	Low	M-High	High	ISR	High	High	-	M-High
COL	M-Low	M-High	M-Low	Low	ITA	M-High	High	-	High
ZAR	M-Low	M-Low	M-High	M-Low	CIV	-	M-Low	High	M-High
CRI	M-High	M-High	M-Low	M-Low	JAM	M-Low	M-High	M-High	M-High
HRV	M-High	-	-	High	JPN	High	High	-	High
CUB	M-High	M-High	-	Low	JOR	M-Low	M-Low	-	M-High
CYP	M-High	High	-	-	KAZ	High	M-High	-	Low
CZV	High	M-High		High	KEN	M-Low	Low	M-High	M-High
CZE	High	M-High	-	High	PPK	M-High	M-High	M-High	High
COG	-	Low	M-High	M-Low	KWT	M-High	High	-	M-Low
DNK	High	High	-	High	KGZ	-	M-Low	-	Low
DJI	-	M-Low	Low	-	LAO	-	Low	M-High	M-Low

TABLE 4. Groups by education, income, settler mortality, and population density in 1500. Low means that the country average is below the $25th$ percentile, M-Low between the $25th$ and $50th$ percentiles, M-High between the $50th$ and $75th$ percentiles, and High above the $75th$ percentile.

Country	Educ	Income	Settler Mortality	Pop Density	Country	Educ	Income	Settler Mortality	Pop Density
LVA	High	M-High	-	M-Low	SLE	Low	M-Low	High	M-High
LBN	-	M-High	-	M-High	SGP	M-High	High	Low	Low
LSO	M-Low	Low	-	Low	SVK	High	M-High	-	High
LBR	Low	Low	High	M-High	SVN	High	-	-	M-High
LBY	Low	M-High	-	Low	SOM	-	Low	-	M-Low
LTU	High	M-High	-	M-Low	ZAF	M-High	M-High	Low	Low
MKD	-	-	-	High	ESP	M-High	High	-	High
MDG	-	Low	High	M-Low	LKA	M-High	M-Low	M-Low	High
MWI	M-Low	Low	-	Low	SDN	Low	Low	M-High	M-Low
MYS	M-High	M-High	Low	M-Low	SWZ	M-Low	M-High	-	Low
MLI	Low	Low	High	Low	SWE	High	High	-	M-Low
MRT	Low	Low	High	Low	CHE	High	High	-	High
MUS	M-High	M-High	Low	Low	SYR	M-Low	M-High	-	M-High
MEX	M-Low	M-High	M-Low	M-High	TWN	M-High	M-High	-	
MDA	High	M-Low	-	M-Low	TJK	High	M-Low	-	Low
MNG	-	M-Low	-	Low	TZA	-	Low	High	M-Low
MAR	-	M-Low	M-High	M-High	THA	M-High	M-Low	M-High	M-High
MOZ	Low	Low	-	M-Low	TGO	Low	Low	High	M-High
KOR	-	M-High	-		TTO	M-High	High	M-High	M-Low
NAM	-	M-High	-	Low	TUN	Low	M-Low	Low	M-High
NPL	Low	Low	-	High	TUR	M-Low	M-High	-	High
NLD	High	High	-	High	TKM	-	M-High	-	Low
NZL	High	High	Low	Low	ARE	M-Low	High	-	M-Low
NIC	M-Low	M-Low	M-High	M-Low	UGA	Low	Low	High	M-High
NER	Low	Low	High	Low	GBR	High	High	Low	High
NGA	-	Low	High	M-High	UKR	-	M-High	-	M-Low
NOR	High	High	-	M-Low	URY	M-High	M-High	M-Low	
OMN	-	High	-	M-Low	USA	High	High	Low	Low
PAK	Low	Low	Low	High	UZB	-	M-High	-	Low
PAN	M-High	M-High	M-High	M-Low	VEN	M-Low	High	M-Low	Low
PNG	Low	M-Low	M-High	M-Low	VNM	M-Low	M-Low	M-High	M-High
PRY	M-High	M-Low	M-Low	Low	VNS	-	Low	M-High	M-High
PER	M-High	M-High	M-Low	M-Low	YEM	-	M-Low	-	M-High
PHL	M-High	M-Low	-	M-Low	YEA	-	Low	Low	M-High
POL	High	M-High	-	High	YEP	-	M-High	-	M-High
PRT	M-Low	M-High	-	High	YUG	M-High	M-High	-	High
ROM	High	Low	-	High	ZMB	M-Low	Low	-	Low
RUS	High	M-High	-	M-Low	ZWE	M-Low	M-Low	-	Low
RWA	Low	Low	High	High					
SAU	-	High	-	Low					
SEN	Low	M-Low	M-High	M-High					

TABLE 5. Groups by education, income, settler mortality, and population density in 1500. Low means that the country average is below the $25th$ percentile, M-Low between the $25th$ and $50th$ percentiles, M-High between the $50th$ and $75th$ percentiles, and High above the $75th$ percentile. (Cont.)

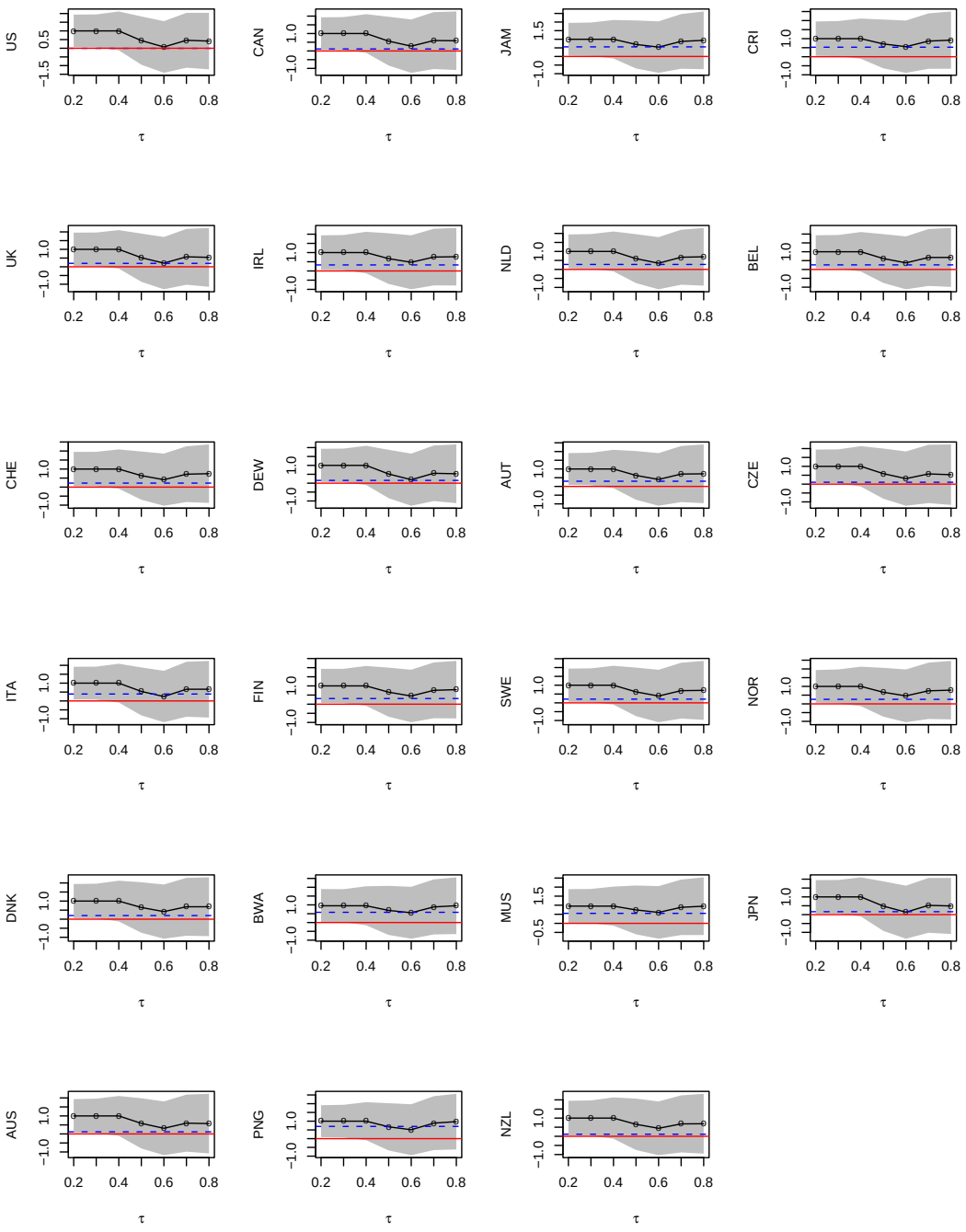

FIGURE 1. Country effect estimates in a model for the Polity IV measure of democracy. The figure presents results for countries with at least one individual effect significant at 1 percent, in a model that includes log of GDP at t-1, log of population, and schooling. The continuous line with dots represents the quantile regression country effects estimates and the dashed blue line the mean fixed effect. The shaded grey area represents a pointwise confidence interval.

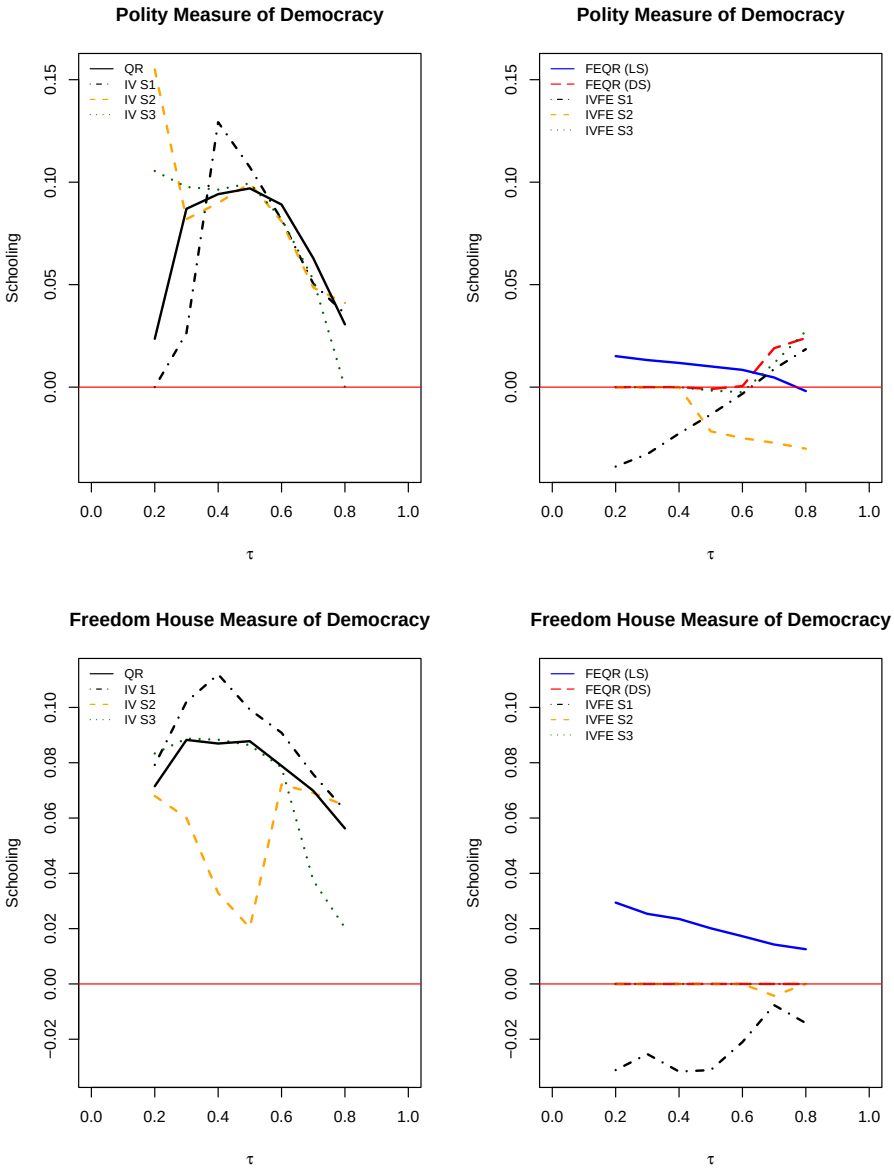

FIGURE 2. Quantile regression estimates of the effect of education on democracy considering the full sample of countries. The panels show point estimates obtained by using quantile regression for the pooled data (QR), instrumental variable with and without fixed effects (IVFE, IV), and quantile regression with fixed effects assuming that the individual effects are either location shifts (LS) or distributional shifts (DS). The instrument sets (S1-S3) are described in Table 3.

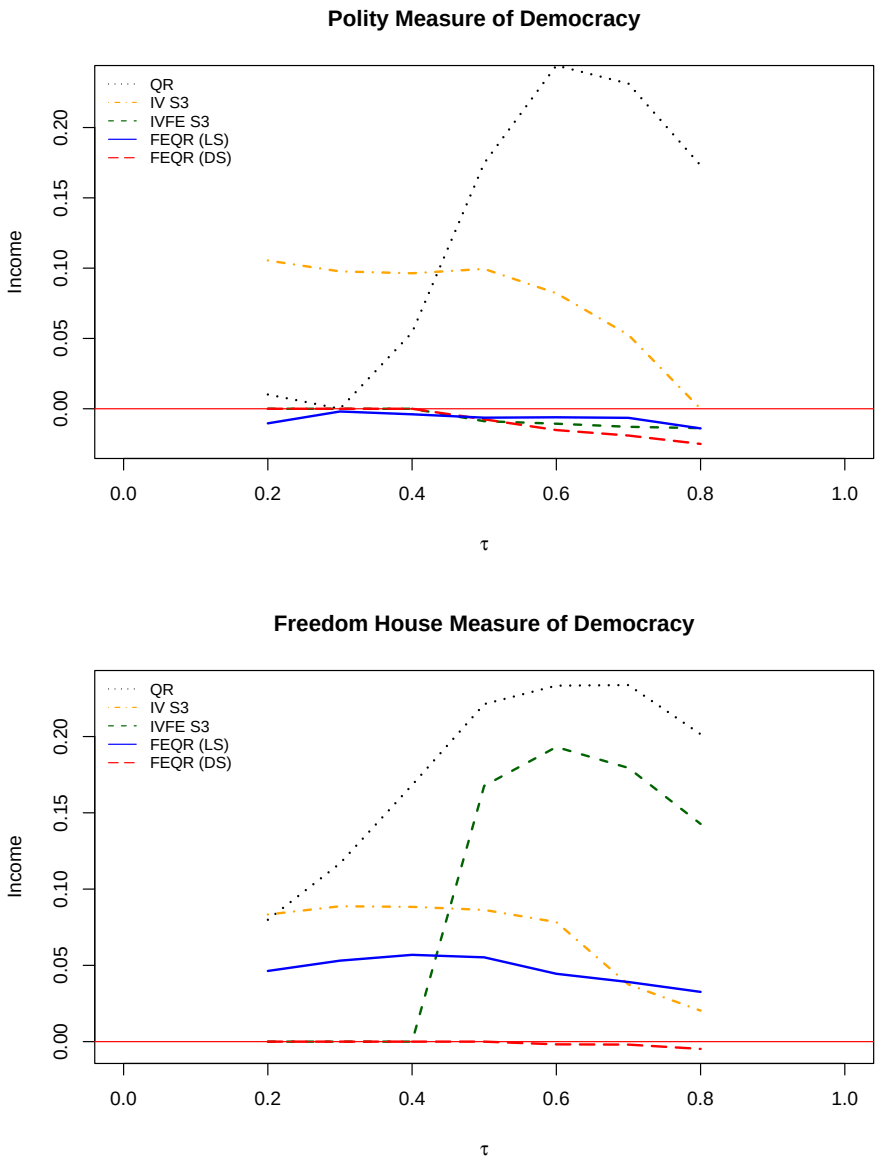

FIGURE 3. More evidence on the distributional effect of income on democracy. The sample includes countries with positive standard deviation of democracy. The panels show point estimates obtained by using quantile regression for the pooled data (QR), instrumental variable with and without fixed effects (IVFE, IV), and quantile regression with fixed effects assuming that the individual effects are either location shifts (LS) or distributional shifts (DS). The instrument set S2 includes trade-weighted world income as in Acemoglu et. al. (2008).

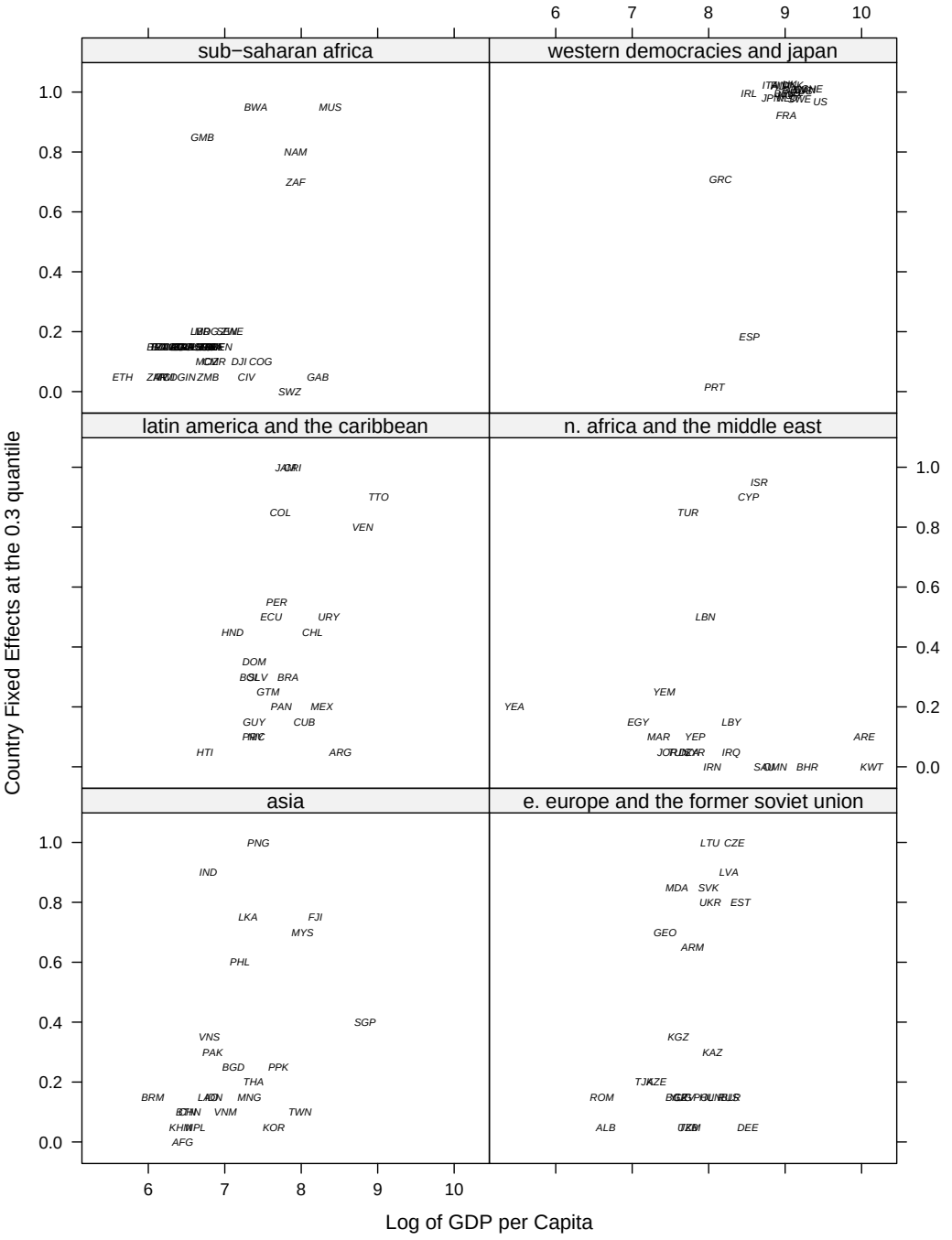

FIGURE 4. Scatterplot of country effects and income. The country effects were estimated at the 0.3 quantile of the conditional distribution of democracy, in a linear model that includes log of DGP at $t-1$ and log of population. The dependent variable democracy is constructed based on the Polity measure. See the Appendix for data definitions.

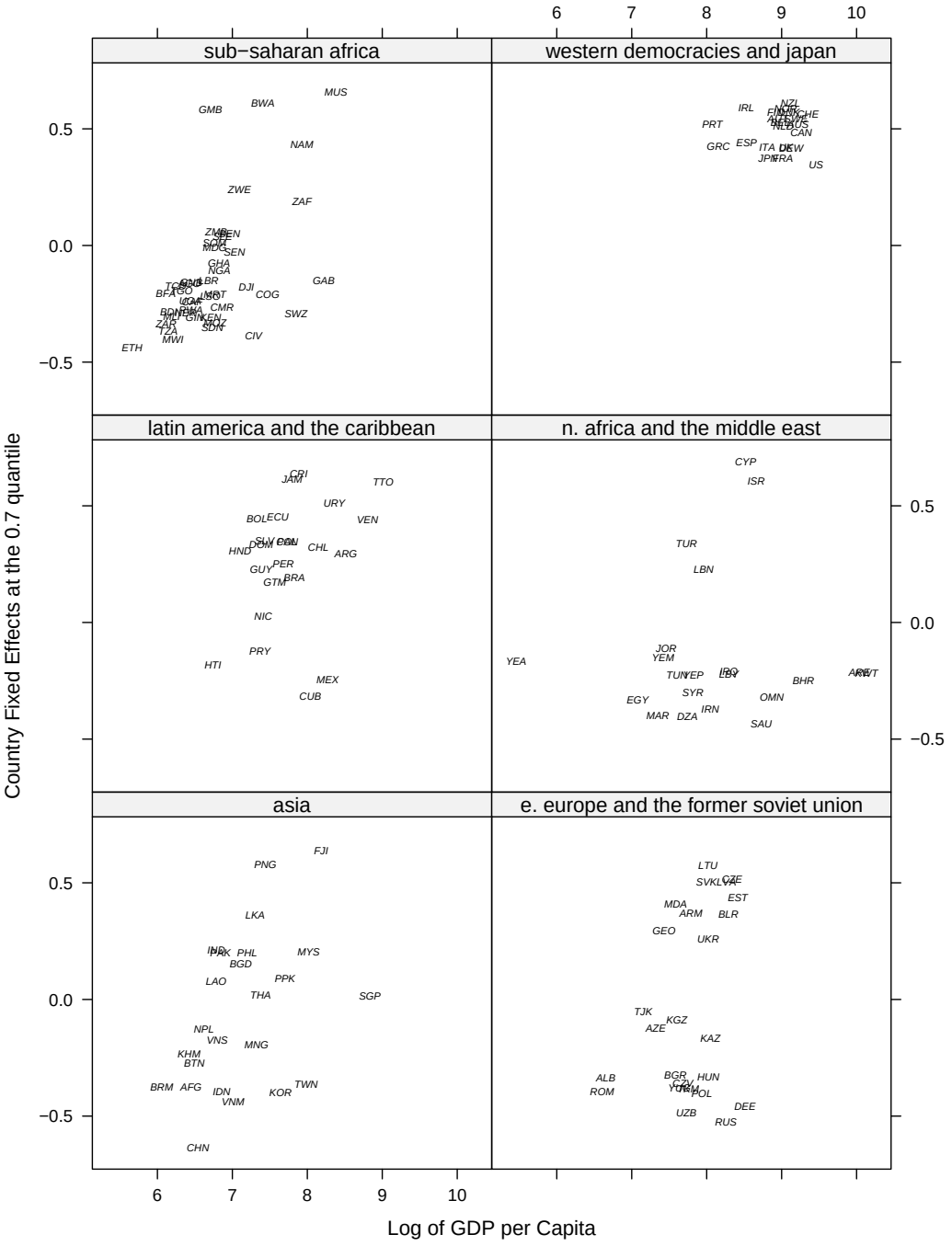

FIGURE 5. Scatterplot of country effects and income. The country effects were estimated at the 0.7 quantile of the conditional distribution of democracy, in a linear model that includes log of DGP at $t-1$ and log of population. The dependent variable democracy is constructed based on the Polity measure. See the Appendix for data definitions.

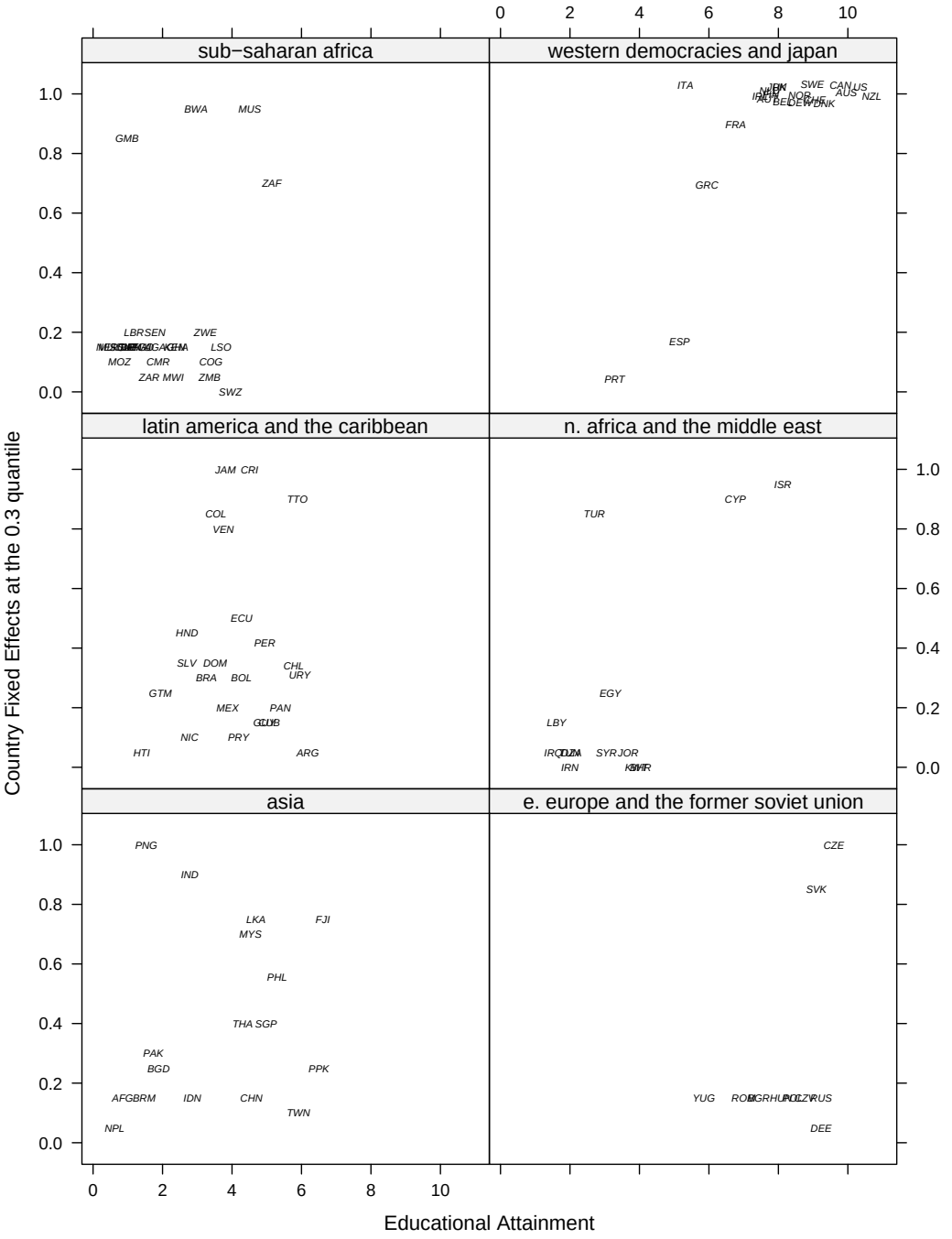

FIGURE 6. Scatterplot of country effects and average years of schooling. The country effects were estimated at the 0.3 quantile of the conditional distribution of democracy, in a linear model that includes log of DGP at $t-1$, log of population, and schooling. The dependent variable democracy is constructed based on the Polity measure. See the Appendix for data definitions.

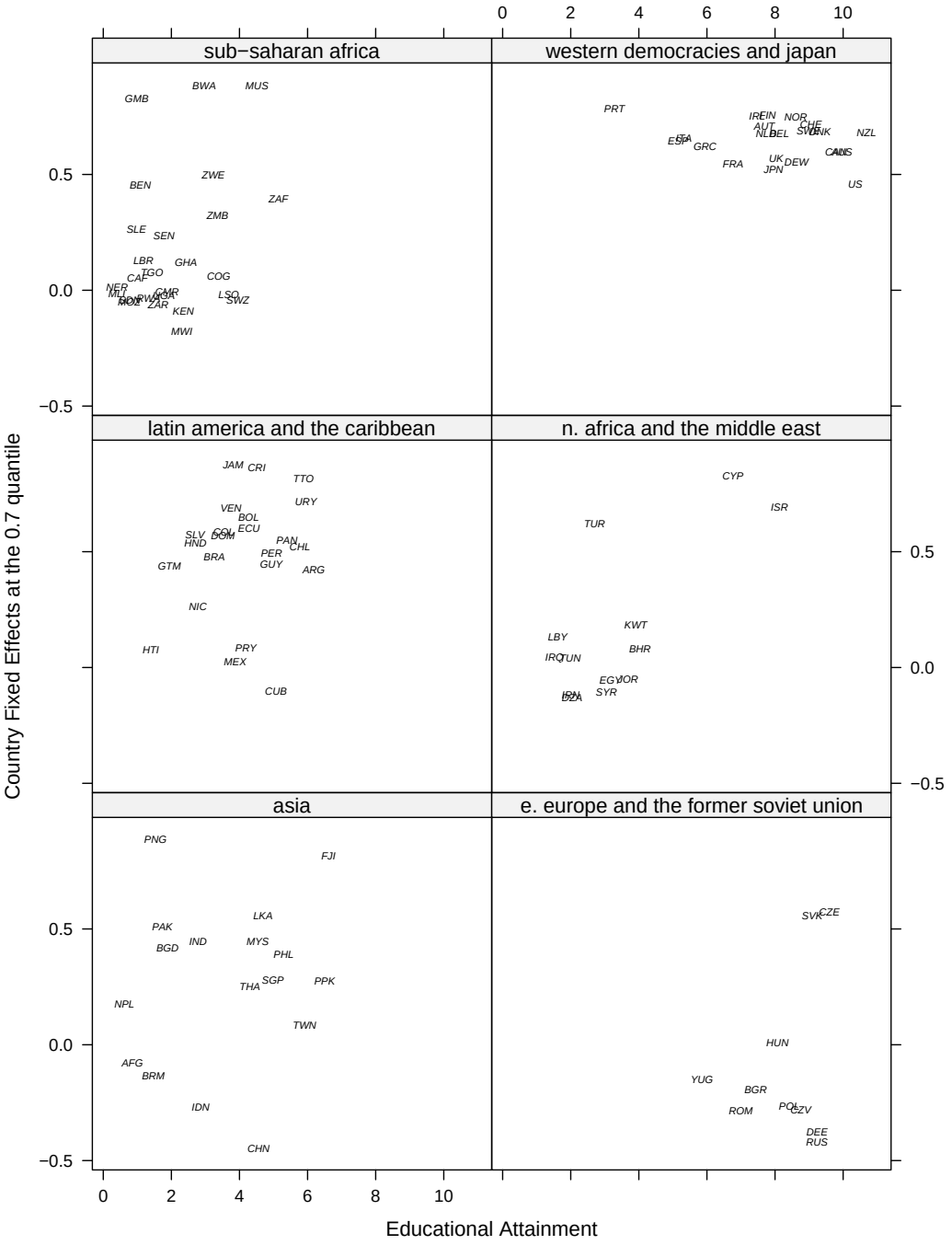

FIGURE 7. Scatterplot of country effects and average years of schooling. The country effects were estimated at the 0.7 quantile of the conditional distribution of democracy, in a linear model that includes log of DGP at $t-1$, log of population, and schooling. The dependent variable democracy is constructed based on the Polity measure. See the Appendix for data definitions.