Online Supplement: Is God in the Details? A Reexamination of the Role of Religion

in Economic Growth

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Appendix A: Monte Carlo Experiment Results for 2SLS-MA

Our Monte Carlo simulation study evaluates the finite sample performance of 2SLS-MA in the case of just identification. The setting is based on equations $(1)-(2)$ in the text by assuming ten endogenous variables and no exogenous variables in the growth equation.

$$
g_j = 0.5 + \beta_{1,j} X_{1,j} + \dots + \beta_{10,j} X_{10,j} + \varepsilon_j
$$
 (A1)

and

$$
X_{i,j} = 0.5 + \pi_i z_{i,j} + v_{i,j}, \quad i = 1,...,10
$$
 (A2)

The error ε_j is *i.i.d.* $N(0,1)$ and $z_{i,j}$ is a set of ten independent *i.i.d.* $N(0,1)$ random variables. The slope coefficients of the growth equation (A1) are determined by the rule $\beta_j = 2\sqrt{2\alpha} j^{\alpha-1/2}$. The parameter α controls the degree of shrinkage of the coefficient for additional regressors and is varied between 1.5, 3.0, and 4.5. The error $v_{i,j}$ in equation (A2) is determined by the rule, $v_{i,j} = \rho^{2i} \varepsilon_j + (1 - \rho^i)^2 \xi_{i,j} / \sqrt{\rho^{2i} + (1 - \rho^i)^2}$, so that endogeneity diminishes for larger models and where $\xi_{i,j}$ is a set of independent *i.i.d.* $N(0,1)$ random variables. We also investigated the case where the degree of endogeneity is the same for all ten regressors, $\rho^i = \rho$. The parameter ρ is set to 0.5. The fit of the first stage equation is controlled by the rule $\pi_i = \sqrt{R_f^2/1 + R_f^2}$, where we set $R_f = 0.9$. Our MC simulation results remained qualitatively the same when we varied R_f and ρ . Finally, we consider sample sizes of 100, 200, and 500 using 500 replications.

First, we discuss the posterior inclusion probabilities using the BIC 2SLS approximation. Table A1 presents posterior inclusion probabilities for the ten variables for three different values of the parameter α , 1.5, 3.0, 4.5, that correspond to low, medium, and high degree of shrinkage, respectively. The results show that for a given value of the parameter α , as the sample size gets larger the posterior weights tend to be larger, consistent with the DGP containing all ten variables. Similarly, for a given sample size, as the shrinkage parameter α gets larger we observe, as expected, that the posterior weights become smaller. Other unreported experiments showed that the results are not sensitive to various other values of the parameter α . We also experimented with two extreme specifications: one that had no shrinkage and one where the DGP contained only one variable. In both cases, we obtained the expected results.

Tables A2 and A3 examine the accuracy of the 2SLS coefficients (posterior means). Table A2 presents the MSE of the coefficients for the ten regressors for different values of the parameter α and different sample sizes. The results show that as the sample gets larger the accuracy of the coefficients increases for all three values of α . Table A3 also reports the DGP as well as the 25th, 50th, and $75th$ quantiles of the MC distribution of the coefficients for $n=200$ (results for other sample sizes are similar and available upon request) for α taking values of 1.5, 3.0, and 4.5. As we move from low shrinkage to high shrinkage, the DGP effectively represents smaller models. As expected, our 2SLS-MA estimator correctly reflects the DGP. In particular, when the shrinkage parameter is large so that higher numbered regressors have coefficients close to zero we get a tight sampling distribution.

	$\alpha = 1.5$					$\alpha = 3$				$\alpha = 4.5$			
	DGP	$N = 100$	$N = 200$	$N = 500$	DGP	$N = 100$	$N = 200$	$N = 500$	DGP	$N = 100$	$N = 200$	$N = 500$	
X_1	3.576	1.000	1.000	1.000	5.058	1.000	1.000	1.000	6.194	1.000	1.000	1.000	
X_{2}	0.894	1.000	1.000	1.000	0.447	1.000	1.000	1.000	0.194	0.993	1.000	1.000	
X_{3}	0.397	1.000	1.000	1.000	0.108	0.762	0.945	1.000	0.025	0.250	0.279	0.450	
X_{4}	0.224	0.993	1.000	1.000	0.040	0.256	0.319	0.545	0.006	0.141	0.121	0.099	
X_{5}	0.143	0.801	0.968	1.000	0.018	0.155	0.136	0.161	0.002	0.131	0.094	0.074	
X_6	0.099	0.536	0.788	0.987	0.010	0.125	0.106	0.098	0.001	0.122	0.090	0.070	
X_{7}	0.073	0.392	0.500	0.849	0.006	0.137	0.103	0.075	0.000	0.133	0.100	0.065	
X_{8}	0.056	0.272	0.368	0.610	0.003	0.121	0.102	0.069	0.000	0.119	0.100	0.066	
$X_{\rm o}$	0.044	0.199	0.280	0.444	0.002	0.106	0.101	0.070	0.000	0.104	0.096	0.067	
X_{10}	0.036	0.182	0.212	0.331	0.002	0.114	0.098	0.071	0.000	0.115	0.096	0.068	

Table A1: Monte Carlo Results for Posterior Inclusion Probabilities

	$\alpha = 1.5$				$\alpha = 3$				$\alpha = 4.5$				
	DGP	25%	50%	75%	DGP	25%	50%	75%	DGP	25%	50%	75%	
Const.	0.500	0.436	0.503	0.566	0.500	0.419	0.477	0.532	0.500	0.451	0.505	0.558	
X_1	3.576	3.551	3.577	3.600	5.058	5.035	5.058	5.080	6.194	6.172	6.195	6.218	
X_2	0.894	0.869	0.894	0.916	0.447	0.422	0.447	0.468	0.194	0.169	0.194	0.215	
X_3	0.397	0.374	0.396	0.420	0.108	0.085	0.106	0.130	0.025	0.000	0.003	0.020	
X_4	0.224	0.201	0.223	0.247	0.040	0.006	0.038	0.062	0.006	-0.001	0.000	0.003	
X_5	0.143	0.119	0.143	0.164	0.018	0.000	0.008	0.038	0.002	-0.001	0.000	0.001	
X_{6}	0.099	0.078	0.099	0.120	0.010	0.000	0.002	0.024	0.001	-0.001	0.000	0.001	
X_7	0.073	0.048	0.073	0.095	0.006	0.000	0.001	0.020	0.000	-0.001	0.000	0.001	
X_{8}	0.056	0.028	0.056	0.078	0.003	0.000	0.000	0.018	0.000	-0.001	0.000	0.001	
X_{9}	0.044	0.010	0.044	0.071	0.002	0.000	0.000	0.023	0.000	-0.001	0.000	0.001	
X_{10}	0.036	0.003	0.032	0.059	0.002	0.000	0.000	0.016	0.000	-0.001	0.000	0.001	

Table A3: Monte Carlo Results for Quantiles of Coefficient Estimates for *N***=200**

Appendix B: Data

Appendix C:

Table C1: List of Countries

Notes:

*In Barro and McCleary (2003) Bangladesh, Hungary, and Poland were dropped from the first period while Germany and South Africa were dropped from the third period.

╪ Our extended dataset adds Uruguay and Venezuela and drops Bangladesh, Cyprus, Germany, and Iceland from all three periods. Additionally, Poland was dropped from the first period and South Africa from the third period.

Table C2: MA and Classical Estimation Results for Growth Regression (Panel A)

Table C2: MA and Classical Estimation Results for Growth Regression (Panel B)

Table C2: MA and Classical Estimation Results for Growth Regression (Panel C)

Table C2 shows the results for the growth regression, (equation (1) in text), using MA (columns (1)-(4)) and Classical estimation (columns (5)- (6)). The time periods are 1965–75, 1975–85, and 1985–95. Time dummies are included for each period. The dependent variable is the growth rate of real per capita GDP for each period. Following Barro and McCleary (2003) and Barro and Sala-i-Martin (2003) the instrument list includes the two regional dummies; real GDP per capita in 1960, 1970, and 1980; average ratios of investments to GDP and average population growth rates for 1960-65, 1970-75, and 1980-85; schooling in 1965, 1975, and 1985; reciprocal of life expectancy at age 1 in 1960, 1970, and 1980; log of the total fertility rate in 1969, 1970, and 1980; average ratio of exports plus imports to GDP (filtered) for 1960-65, 1970-75, and 1980-85; average ratios of (net) govt. consumption to GDP for 1965–75, 1975–85, and 1985–95; growth rate of the terms of trade over 1965–75, 1975–85, and 1985–95 interacted with the average ratio of exports plus imports to GDP; the Freedom House measure of political rights and its square in 1972, 1975, and 1985; lcr100km; KGATRSTR; Language; the average value of Expropriation Risk for the periods 1982-84 and 1985-94; Rule of Law in 1982 or 1985 and its average value for 1985-94. Inflation is instrumented with the Spain or Portugal colonial dummy. Religiosity variables are instrumented with the dummy variables for state religion, state regulation of religion, and religious pluralism. Religion shares are instrumented with value of the shares in 1970 (first two periods) and 1980 (third period). Contracting institutions are instrumented with British legal origin. Posterior robust (White) standard errors are in parentheses. "***" denotes significance at 1%, "**" at 5%, and "*" at 10%. "ϒ" denotes joint p-value while "#" denotes posterior probability of theory inclusion.

Table C3: Posterior Mode Models

Table C3 shows the posterior models that correspond to the largest posterior model probability for all the models used in the two Model Averaging exercises of Table 2. Column 1 shows the posterior mode model for 2SLS-BIC, and column (2) shows the results for LS-BIC. We report coefficient estimates and standard errors in parentheses. The time periods are 1965–75, 1975–85, and 1985–95. Time dummies are included for each period. The dependent variable is the growth rate of real per capita GDP over 1965–75, 1975–85, and 1985–95. Robust (White) standard errors are in parentheses. "***" denotes significance at 1%, "**" at 5%, and "*" at 10%.