Is God in the Details? A Reexamination of the Role of Religion in Economic Growth[#]

Steven N. Durlauf, Andros Kourtellos, and Chih Ming Tan

September 27, 2006

JEL Classification Codes: C59, O40, Z12

Keywords: Economic growth, Religion, Model Uncertainty

[#] We thank the National Science Foundation, University of Wisconsin Graduate School, Tufts University, as well as a grant from USAID/International Food Policy Research Institute (IFPRI) for research support. Christopher Lintz and Ioanna Stylianou provided excellent research assistance.

Abstract

Barro and McCleary (2003) is a key research contribution in the new literature exploring the macroeconomic effects of religious beliefs. This paper represents an effort to evaluate the strength of their claims. We evaluate their results in terms of replicability and robustness. While we find that their analysis meets the standard of statistical replicability, we do not find that the results are robust to changes in their baseline statistical specification. Taken together, we conclude that their analysis cannot be taken to provide useable evidence on how religion might affect aggregate outcomes.

Steven N. Durlauf
Department of Economics
University of Wisconsin
1180 Observatory Drive
Madison, WI 53706-1393
sdurlauf@ssc.wisc.edu

Andros Kourtellos
Department of Economics
University of Cyprus
P.O. Box 20537, CY-1678
Nicosia, Cyprus
andros@ucy.ac.cy

Chih Ming Tan
Department of Economics
Tufts University
8 Upper Campus Road
Medford, MA 02155
chihming.tan@tufts.edu

1. Introduction

One of the notable recent developments in economics has been the rise of interest in the study of how religion affects aggregate economic outcomes. A key paper stimulating this new literature is Barro and McCleary (2003)[1]. Barro and McCleary provide evidence that some aspects of religious beliefs (notably belief in hell) correlate positively with economic growth while church attendance correlates negatively with growth, once one has controlled for a set of alternative growth determinants. They interpret their results to mean that all else equal countries with more efficient religious sectors – that is, religious sectors that require less church attendance input to generate a given level of religious beliefs output – will tend to grow faster. While previous studies, e.g. Fernandez, Ley and Steel (2001) and Doppelhofer, Miller, and Sala-i-Martin (2004), have identified a relationship between religious affiliations and growth in the context of a general search for growth determinants, the work by Barro and McCleary brought attention to the beliefs embodied in religious affiliations.

The finding by Barro and McCleary that religion may be important to growth is an important one as it represents a new direction in the effort to identify sources of inequality across nations that lie outside the domain of the canonical neoclassical model. Explanations of this type, including geography (Sachs (2003)), institutions (Acemoglu, Johnson, and Robinson (2001, 2002), Acemoglu and Johnson (2005)) and ethnic heterogeneity (Easterly and Levine (1997) and Alesina et al (2003)), have proven very valuable in understanding cross-country differences. To the extent that religion proves similarly useful, it may well represent the beginning of a major new research direction.

This paper is designed to assess the strength of the evidence for a religion/growth nexus in the context of Barro and McCleary's seminal work. We do this at two levels. First, we reevaluate their statistical analysis. This reevaluation includes both strict replication questions, i.e. can one find the results they report using their data and models, as well as an assessment of the robustness of their analysis to alternate statistical models.

[1]Other work in this area includes Cavalcanti, Parente, and Zhao (2004), Guiso, Sapienza and Zingales (2003), and Noland (2005).

We find that while their analysis is statistically replicable, it is not statistically robust. There is little evidence of a direct religion/growth nexus. Next we explore the question of whether religion may nevertheless be an indirect determinant of growth via growth proximates. We find no evidence to support this contention. As a result, we conclude that God is not in the details, at least not in so far as their claims that religion matters for growth.

While our analysis focuses on a specific paper, we hope the range of questions we ask and methods we employ will also be useful in describing how evidentiary support for a given growth theory should be subjected to evaluation. A problem with much of the empirical literature on growth is the tendency for the literature to focus on large claims without a commensurate degree of interest in exhaustive analysis of the strength of the claims. We hope that our admittedly unglamorous analysis shows the importance of the latter.

Section 2 of this paper describes the Barro-McCleary data and demonstrates basic statistical replicability of their baseline model. Section 3 evaluates the robustness of the religion/growth relationship to a richer set of growth models. Section 4 evaluates the relationship between fundamental and proximate growth determinants. Section 5 concludes.

2. Growth regression model and data

Barro and McCleary investigate the effects of religion on economic growth within the framework of linear cross-country growth regressions. The canonical form of such a regression is

$$g_j = R_j \beta_R + X_j \pi + \varepsilon_j \tag{1}$$

In this regression, g_j is the average growth rate of per capita income for country j across a time period $[t, t+T]$, R_j contains the set of variables of interest to the

researcher – in our context, this is the set of religious beliefs and church attendance variables (which we will refer to collectively as *Religiosity* variables) as well as the set of *Religion Shares* – while X_j is a set of additional growth determinants a researcher wishes to control in the analysis.

Barro and McCleary employ an unbalanced panel dataset of a total of 41 countries (see Table 1) over three periods 1965-74 (38 countries), 1975-84 (41 countries), and 1985-94 (39 countries). The number of observations range from 113 to 123 across specifications. The dependent variable is the average growth rate of real per capita GDP corresponding to the three periods. The set of Religiosity measures consists of countrywide average responses based on survey questions reported in the three waves of the World Values Survey or WVS (1981-84, 1990-93, and 1995-97) as well as data from the International Social Survey Programme on monthly church attendance, belief in hell, and belief in heaven. To minimize the loss of information Barro and McCleary construct single cross-sectional measures as follows. A measure of attendance or belief for a country is defined as the value from WVS 1990 if available. If not, then the value from WVS 1981 is used. If neither of these values were available, then the values for ISSP 1991, WVS 1995, and ISSP 1998 were used in an analogous way. Finally, the value is adjusted for the average discrepancy between the two values among countries that had information for both years.

Based on Barrett (1982), the data on Religion Shares include adherent shares for Catholic, Eastern, Hindu, Jewish, Muslim, Orthodox, Protestant, and Other religions for the years 1970 and 1980. Each religion share is defined as the fraction adhering to the specified religion among persons who expressed adherence to some religion. The Catholic fraction is omitted from the regressions and thus each coefficient should be interpreted relative to the Catholic share. We note that Barro and McCleary generously provided us with the Religiosity and Religion Shares data.

The set of additional control variables X_j employed by Barro and McCleary includes time dummies for each of the three time periods, Religion Shares, as well as the set of variables that Barro and Sala-i-Martin (2003) had found to be robust determinants of growth. These variables, measured separately in each period, are: the log of initial per capita GDP, the average years of male secondary and higher school attainment, the

reciprocal of life expectancy at age 1, the average investment to GDP ratio, the log of the total fertility rate, the ratio of exports plus imports to GDP (filtered for the usual relation of this ratio to the logs of population and area), the ratio of government consumption (net of outlays on defense and education) to GDP, the growth rate of the terms of trade interacted with the ratio of exports plus imports to GDP, the Political Risk Services indicator of the rule of law, the Freedom House measure of political rights and its square, and the consumer price inflation rate. We obtained the data for these additional control variables from various sources including Barro and Lee (1994); see the Data Appendix[2].

To address issues of the possible endogeneity of right-hand side variables, Barro and McCleary instrument the Religiosity variables with a dummy variable that indicates the presence of a State Religion in 1970, a dummy variable that indicates the presence of State Regulation of religion in 1970, and a measure of Religious Plurality. This last variable is defined as one minus the Herfindahl index constructed from the Religion (adherence) Shares in 1970 and 1980 (1990 for Poland). For the calculation of this index, the share of Buddhism was distinguished from the share of other Eastern religions. To deal with the endogeneity of Religion Shares, they use as instruments the lagged shares; 1970 for the first two periods and 1980 for the third. The instrument list for the additional controls includes beginning of period or lagged values of all the covariates with the exception of inflation. Inflation is instrumented with the Spain and Portuguese colonial dummy.

The key findings of Barro and McCleary (2003) are reported in Table 4 of that paper. Table 3 of this paper contains our replication results. We were able to replicate Barro and McCleary's results relatively closely. In particular, our replication results affirm Barro and Cleary's results for belief in hell and monthly church attendance. As shown in Table 3, monthly church attendance is negative while belief in hell or belief in heaven is positive. As in Barro and McCleary these coefficients are individually and jointly statistical significant. There are only a few small differences in the degree of significance. Our replication shows stronger evidence in favor of belief in heaven but weaker evidence in belief in hell. More precisely, while Barro and McCleary find that

[2] Barro and McCleary did not share most of these data with us, which will prove to have some, but not great, significance below.

belief in heaven is not significant in system (4) we find that it is significant at 1%. Conversely, while Barro and McCleary find that belief in hell is significant in systems in (5) and (6) at 1% and 0.1%, respectively, we find that they are significant at 5% and 10%, respectively. We were also able to affirm the marginal significance for Muslim, Orthodox, and Protestant Shares. While we were not able to confirm the statistical significance of the Hindu share we were able to verify the joint statistical significance of Religion Shares. Overall, we conclude that Barro and McCleary's results are generally statistically replicable using the data they provided. We attribute the small discrepancies of our replication exercise to the fact that they did not share with us their data on the set of additional controls.

3. Robustness of the religion/growth relationship

3.1 Discussion

While Barro and McCleary's claims appear to be statistically replicable, a separate question is whether they are statistically robust. As Brock and Durlauf (2001) and other researchers have argued, exploring the quantitative consequences of new growth theories presents unique challenges to researchers. These difficulties arise to a large extent because the nature of growth theories is such that they are inherently *open-ended*. By theory open-endedness, Brock and Durlauf refer to the idea that, in general, the statement that a particular theory of growth is relevant does not logically preclude other theories of growth from also being relevant. This means that an evaluation of the statistical relationship between growth and religion needs to account for the plethora of growth determinants that exist in the empirical literature; specifically, a causal relationship between religion and growth has no implications for whether a causal relationship exists between geography and growth or any other variable.

Dealing with theory uncertainty is therefore of first-order importance if we are concerned with understanding the strength of evidential support for the link between religiosity variables and growth. Barro and McCleary avoid this issue by choosing to

include additional control variables on the basis of an assessment of what Barro and Sala-i-Martin (2003) identify as empirical important growth determinants. But this assessment itself relies on a subjective reading of a body of papers that themselves suffer from a lack of attention to this same question Thus, they in essence engage in model selection without the formal specification of a common body of data, a set of models to consider, and a well defined metric for evaluation.

It is also far from clear that their choices on growth controls well reflect the current state of empirical thinking on growth. An important substantive problem in their analysis is the lack of evaluation of religion against alternative fundamental growth determinants, in particular institutions, geography, and ethnic heterogeneity, each of which has been found by other authors to be empirically important. None of these alternate channels was a part of the model selection exercise employed to identify additional controls in the Barro and McCleary analysis.

Finally, it is unclear that model selection is even appropriate for an exercise of this type. There is a range of possible growth specifications, inference on the religion/growth nexus should reflect the relative evidentiary support for each model, not be contingent on one of the models, even if there is a sense that it has the highest posterior probability of being the true one.

For these reasons, we regard it as important to evaluate the robustness of their findings. To evaluate robustness, we employ model averaging methods to account for the broad theoretical background against which a religion/growth relationship must be assessed. We refer the reader to the Technical Appendix for a full description of our implementation of these methods. Model averaging methods have proven useful in a number of growth studies, see Brock and Durlauf (2001), Fernandez, Ley and Steel (2001), Doppelhofer, Miller, and Sala-i-Martin (2004) and Masanjala, and Papageorgiou (2005) for examples in the growth literature; the methodology has also proven useful in both macroeconomics (Brock, Durlauf, and West (2006) and Cogley and Sargent (2004)) and in economic forecasting (Garratt et al (2003)). Our current application is somewhat different from those in that we focus on a specific theory rather than engage in a horserace across all theories. This strategy is chosen since our goal is to assess the

religion/growth relationship against the current body of growth theories, not assess all theories simultaneously.

To understand the model averaging approach, suppose that a parameter vector β_R characterizes the effects of different Religiosity variables on growth. A standard frequentist exercise of the type performed by Barro and McCleary constructs estimates of this parameter that are conditional on *D*, the available data, and *m,* the specification of a growth model,

$$g_j = R_j \beta_{R.m} + X_{j,m} \pi + \varepsilon_{j,m} \tag{2}$$

where models are differentiated by the choice of control variables X; denote estimated religion parameters as $\hat{\beta}_{R|D,m}$. Estimates of the uncertainty of the estimate, i.e. standard errors, may similarly be conceptualized as both data and model dependent. As such, this sort of calculation means that prior knowledge is assumed about the "true" growth process; i.e., that it is adequately described by model *m*.

We propose, instead, to calculate objects that are interpretable as $\hat{\beta}_{R|D,M}$, i.e. parameter estimates that condition on *M*, the collection of candidate models for the true growth process; we subsequently refer to this as the model space. That is, we do not want to engage in analysis of a particular $\hat{\beta}_{R|D,m}$ or a small set of estimates whose differences are based on perturbations of a baseline model. Rather, we ask what information about β_R is found when one considers a general space of growth models. How is such a general model space defined? Operationally, one specifies a set of potential growth controls X and constructs all possible combinations of the elements of this space. Each combination of elements, when appended to (1) defines one of the candidate models of the form (2). Combination across models means that we obtain an average of model-specific results $\hat{\beta}_{R|D,m}$ using model weights $\mu\left(m\middle|D\right)$, i.e.

$$\hat{\beta}_{R|D,M} = \sum_{m \in M} \hat{\beta}_{R|D,m} \mu\left(m\middle|D\right) \tag{3}$$

This formulation exhibits an important tension in incorporating model uncertainty into frequentist analysis: frequentist methods assign probabilities of observables (e.g. parameter estimates) given unobservables (e.g. the true parameters) whereas our goal is to eliminate the condition of an unobservable.

One solution is to pursue a full Bayesian analysis, cf. Raftery et al (1997), etc. And in fact, if one assumes that the regressors are nonrandom and regression errors are i.i.d. normal with known variance, then under a diffuse prior on the regression coefficients, the posterior density of the coefficient will have the property that the posterior mean and variance equal the OLS estimate and variance covariance matrix. The weights $\mu(m|D)$ in this context are posterior model probabilities. However, we prefer the interpretation developed by Doppelhofer, Miller, and Sala-i-Martin (2004) that our robustness exercise is a Bayesian average of classical estimates. In other words, we will use model weights that have an interpretation as model probabilities, Brock, Durlauf and West (2003) call this approach a pseudo-frequentist analysis. We note that this approach is advocated in statistics papers including Candolo, Davison, and Demétrio (2003); see also Hjort and Claeskens (2003) and Hansen (2006) for development of statistical theory.

How should one understand our model weights as posterior model probabilities? Using Bayes' rule

$$\mu(m|D) \propto \mu(D|m)\mu(m) \tag{4}$$

so that each weight is the product of the likelihood of the data given a model, $\mu(D|m)$, and the prior probability for a model, $\mu(m)$. The choice of priors is of course problematic; we discuss our implementation in the Technical Appendix.

3.2 Implementation

In terms of our implementation, as discussed above, our aim is to nest Barro and McCleary's model within a larger model space that includes recent fundamental growth theories. Therefore, in addition to *Religiosity* and *Religion Shares*, we focus on five other *fundamental* growth theories: *Geography*, *Ethnic Fractionalization*, *Political Institutions*, *Property Rights Institutions*, and *Contracting Institutions*. In our view, religion is on par with geography, institutions, and ethnic heterogeneity as a potential fundamental growth determinant. While it seems clear that the weight of the empirical evidence supports the view that institutions[3] are in general a more salient source of growth differences than geography, our own view (cf. Tan (2005)) is that, at least from an a priori standpoint, both potentially play some role.

In keeping with the recent "geography versus institutions" debate in the growth literature (see, Rodrik, Subramanian, and Trebbi (2002) and Sachs (2003)), we include a climate variable – the percentage of a country's land area classified as tropical and subtropical via the Koeppen-Geiger system (KGATSTR) – as well as a measure of geographic accessibility/isolation – the percentage of a country's land area within 100km of an ice-free coast (LCR100KM) under Geography. Political Institutions consist of a measure of democracy and its square. Here we follow Barro and McCleary (2003) who base their choice on work showing a nonlinear relationship between democracy and growth (e.g., Barro (1996)). Following Acemoglu and Johnson (2005), we distinguish between two types of economic institutions: Property Rights Institutions comprise of a measure of the risk of expropriation of private investments as well as a measure of constraints on executive power while Contracting Institutions is proxied by an index of legal formalism (CHECK) measuring the number of procedures for collecting on a bounced check. Finally, we proxy Ethnic Fractionalization with a measure of linguistic fractionalization due to Alesina et al (2003).

[3]Acemoglu, Johnson and Robinson (2001, 2002) are now standard references and Acemoglu, Johnson, and Robinson (2006) is a brilliant overview of the role of institutions in the growth process.

Next, we organize the additional covariates employed by Barro and McCleary (2003) into four *proximate* growth theories: *Initial Heterogeneity* (the log of initial per capita GDP), *Gross Capital Accumulation* (the average years of male secondary and higher school attainment and the average investment to GDP ratio), *Demography* (the reciprocal of life expectancy at age 1, the log of the total fertility rate, as well as a standard population growth rate variable[4] from the canonical Solow framework), and *Macroeconomic Policy* (the ratio of exports plus imports to GDP, the ratio of government consumption to GDP, the growth rate of the terms of trade interacted with the ratio of exports plus imports to GDP, and the inflation rate).

Finally, we include as a theory, *Regional Heterogeneity* – for a final tally of 10 proximate and fundamental growth theories altogether – which consists of a dummy variable for East Asian countries and one for Sub-Saharan African countries. We refer the reader to the Data Appendix for a detailed description of the variables and data.

3.3 Findings

We present our main findings in Table 4 that shows classical least squares (LS; Column 3) and classical two-stage least squares (2SLS; Column 6) as well as BMA least squares (LS; Columns 1 and 2) and BMA two-stage least squares (2SLS; Columns 4 and 5) results. We retain time period dummies in all specifications to capture the fixed time effects.

The classical estimation exercises are essentially "kitchen sink" exercises; i.e., they refer to the largest possible model in our model space (all variables included). The "kitchen sink" approach has been used in growth empirics when a "horserace" between fundamental determinants of growth is desired (see, for instance, Rodrik, Subramanian, and Trebbi (2002) and Sachs (2003)). Our "kitchen sink" results provide weak evidence for the importance of Religiosity to growth. Although monthly church attendance is negative and significant at the 1% level, we only find marginal significance (at the 10% level) for a positive coefficient to belief in heaven (in the 2SLS case). Nevertheless, the

[4] Logarithm of average population growth rate plus 0.05.

joint significance of monthly church attendance, belief in heaven, and belief in hell are found at the 1% level. We also find significance for Muslim, Orthodox, Protestant, and Other Religion shares. Hence, the "kitchen sink" findings are at least broadly compatible with those of Barro and McCleary (even though Barro-McCleary emphasize belief in hell instead of belief in heaven).

The results for the other fundamental determinants for the "kitchen sink" case are also broadly consistent with those of the existing literature. We find the coefficient to initial income per capita to be highly significant at the 1% level and negative. A negative coefficient on log initial income per capita is typically taken as evidence in the literature that poorer countries are catching up with richer countries after controlling for heterogeneity. Our findings are therefore consistent with those in the existing "conditional convergence" literature.

We also find that macroeconomic policies such as trade openness are highly significant and positive for growth while inflation is detrimental to growth. There is some evidence that geography may affect growth. However, the evidence does not support the case that climatic conditions are the reason; it appears instead that geographic accessibility is the key. Interestingly, we find that once trade openness is controlled for, greater geographic accessibility (as measured by LCR100KM) actually has a negative impact on growth; we do not see a natural explanation of this. We also find, similar to Easterly and Levine (1997), Alesina et. al. (2003), and Brock and Durlauf (2001), that ethnic fractionalization has a significant negative impact on growth. Finally, our results for institutions are consistent with those of Acemoglu and Johnson (2005) in that we find strong evidence for the importance of Property Rights Institutions (expropriation risk) while, at least in the 2SLS case, not finding any importance for Contracting Institutions. Our results therefore support Acemoglu-Johnson's thesis that it is the rules governing the interactions between the population and political elites rather than the rules that govern the interactions between individuals that appear to be more salient to growth.

While the "kitchen sink" results are heartening in that they suggest that the model space is comprehensive enough to adequately represent the existing literature, they are contingent on the use of a very specific growth model – i.e., these claims are based on very specific choices of which growth determinants are included in the analysis (all of

them, in this case). However, as discussed in the previous section, we have no reason to come down so heavily on the side of any one particular model. In fact, because we wish to account for model uncertainty, our aim is to be agnostic about which of the many models in the model space is the "true" model (or is closest in some well-defined sense to the "true" model), and then to evaluate whether Barro and McCleary's claims about linkages between religion and growth still hold up once we account for model uncertainty.

We therefore turn now to our BMA results. Our key finding here is that there is no evidence that religious beliefs matter once we control for model uncertainty. Neither belief in hell nor belief in heaven is significant in either columns 2 or 5 of Table 4. The posterior probabilities of inclusion of these variables in the "true" model are also negligible at less than 1%. We find some weak evidence (at the 10% significance level) that monthly church attendance may have a negative effect on growth. However, without the positive significance for the religious beliefs variables, this result alone is insufficient to support Barro and McCleary's contention that countries with more efficient religious sectors will tend to grow faster. The effect of religion on growth, if there is one, is likely to have nothing to do with the efficiency of the religious sector in generating beliefs, and furthermore, is not likely to be positive in the first instance. Nevertheless, overall, the evidence that Religiosity, as a theory, is likely to be in the "true" model is substantial. The posterior probability of theory inclusion for Religiosity is greater than 80%, far higher than the non-informative prior of 50% (see Technical Appendix). However, it is important to emphasize that this outcome is due solely to the high probability (about 80%) that monthly church attendance is included in the "true" model even though its effect on growth is only marginally significant.

The BMA results for the other growth determinants are surprisingly consistent with those in the existing literature. We find robust evidence for "conditional convergence" (1% level significance for a negative coefficient to initial income) as well as for the importance of trade openness, inflation, geographic accessibility (LCR100KM), ethnic fractionalization, and expropriation risk. These results are akin to the results obtained for the "kitchen sink" model above.

In terms of the probability of these theories being included in the "true" model, we find posterior probabilities of theory inclusion greater than 0.5 (our prior) for Regional Heterogeneity (0.84; because of the importance of the East Asia dummy), Initial Heterogeneity (1.00), Gross Capital Accumulation (0.64; because of Schooling), Demography (0.86; because of the inverse of life expectancy), Macroeconomic Policy (1.00; because of openness, government consumption, and inflation), Geography (0.87; because of geographic accessibility), Fractionalization (1.00), and Property Rights Institutions (1.00, because of expropriation risk). The posterior evidence for theory inclusion for Religion Shares (0.20), Political Institutions (0.001), and Contracting Institutions (0.004) were all essentially marginal and far lower than the 0.5 prior. These findings largely dovetail with the existing findings in the literature. It appears therefore that the main outcome of accounting for model uncertainty is, in fact, to challenge the robustness of results for Religiosity.

Figures 1(a)-(c), Tables 5 and 6 provide clues as to why this might be the case. Figure 1 shows density plots for the coefficient to each of the Religiosity variables for the set of models considered under BMA. For instance, Figure 1(a) shows the density plot for the coefficient to monthly church attendance. In this case, the coefficients appear to be predominantly negative across models with concentrations of mass around -0.014 and -0.006. It is not surprising therefore that monthly church attendance is found to have a negative impact on growth. However, we do not observe this same sort of "consensus" for belief in hell (Figure 1(b)) and belief in heaven (Figure 1(c)). In both these cases, we find mass accumulating around 0 as well as positive numbers close to 0.01. The fact that when we conduct BMA across the set of models, we find that the coefficients to these two latter variables are close to 0 (and insignificant) would therefore suggest that the set of models that generate positive coefficients to belief in hell and belief in heaven have lower posterior weights. This is indeed the case. Table 6 presents results for the model corresponding to the posterior mode. In the posterior modal model, neither belief in hell nor belief in heaven is included as a covariate. The posterior weight assigned to the posterior modal model turns out to be close to 0.5 while the next most important model rings in at only 0.1.

Another way to evaluate our model averaging results is to engage in a data mining exercise along the lines of Brock, Durlauf, and West (2003). Let us first consider what would happen if instead of model averaging, the researcher focused on particular "rules-of-thumb" for model selection. Note that, in contrast to model averaging or model selection according to the posterior mode, model selection employing the following "rules-of-thumb" ignores the assignment of posterior evidence to models.

Columns 1-6 of Table 5 shows results when the model corresponding to the minimum or maximum coefficient value for each of the Religiosity variables, respectively, is chosen. Columns 7-9 of Table 5 present results for the models with the largest absolute values[5] of the coefficient to each respective Religiosity variable, among those that are statistically significant at the 5% level. As can be seen, outcomes where both monthly church attendance is negative and significant *and* belief in hell is positive and significant occur if the researcher chooses (1) the model with the minimum coefficient value for monthly church attendance, (2) the model with the maximum coefficient value for belief in hell, or (3) the model with the largest coefficient to belief in hell which is statistically significant. This is in sharp contrast to the results obtained for the model which corresponds to the posterior mode for the set of models considered under BMA (the standard Bayesian model selection rule-of-thumb). Hence, it would appear that in order to obtain something close to Barro-McCleary's results, we would be required to abandon considerations of the relative evidentiary (posterior) weight of alternative models, and choose instead models which presuppose the importance of Religiosity variables.

We find the latter strategy to be objectionable. However, since our model priors, as well as our use of the BIC approximation, directly affect the calculations for posterior weights, we need to assess the robustness of our findings to plausible alternative specifications. We address these considerations below.

In Table 7, we report results assessing the robustness of our BMA results to alternative model prior specifications as well as approximations to the likelihood (please refer to the Technical Appendix for further details). Column 1 of Table 7 reproduces our baseline BMA results (Column 5 of Table 4). Columns 2 to 5 contain results for cases

[5] We omit parallel results on minimum values as they are not economically interesting.

where particular subsets of variables are assumed a priori to be always included in the "true" model. For instance, the BMA exercises for which results are reported in column 2 assume that the variables employed in Barro and McCleary's baseline model are included in all models in the model space. Similarly, column 2 reports results for BMA exercises where the canonical Solow growth variables – initial income, investments, schooling, and population growth rates – are always included in all models. Columns 4 and 5 report results for exercises where, respectively, all Religiosity variables and all Religiosity and Religion Shares variables are retained in all models in the model space. We also experiment with replacing our *hierarchical* model priors with *uniform* priors. That is, we disregard any theoretical distinctions between variables so that instead of having each of the 10 growth *theories* be assigned a .5 prior probability of being included in the "true" model, we allow each individual *variable* instead to have a .5 prior probability of being included in the "true" model. Uniform priors are an alternative means of specifying non-information about which model in our model space is the "true" model (or, is closest to it in some well-defined sense). As we discuss in the Technical Appendix, however, the use of uniform priors, while standard practice in the literature, may nevertheless, be inappropriate in the growth context. In any case, these results are reported in column 6. Finally, column 7 reports results for exercises where instead of using Raftery's BIC approximation for the likelihood, we use the AIC instead. The effect of using the AIC instead of the BIC is to allow for a smaller penalty on larger models.

We find that our baseline results are largely robust to these perturbations. Only in the case where *both* Religiosity and Religion Shares are a priori assumed to be in the "true" model (column 5) do we obtain results comparable with those of Barro and McCleary; i.e., a positive and significant coefficient for belief in hell along with a negative and significant coefficient for monthly church attendance. In all other cases, we find evidence – akin to our baseline results – that, of the set of Religiosity variables, only monthly church attendance is significant (and negative). This finding suggests yet again that Barro and McCleary's results on the importance of religiosity to growth, as well as the interpretation they attach to their results, are heavily contingent on their particular model specification.

In conclusion, the key finding of our robustness analysis is that religious beliefs (in belief in hell or belief in heaven) are not robust determinants of economic growth. At the same time and consistent with the existing literature we find robust evidence for Initial Heterogeneity (that is, conditional convergence), Macroeconomic Policy as manifested by trade openness and inflation, Geography as measured by geographic accessibility, Ethnic Fractionalization as measured by linguistic fractionalization, and Property Rights Institutions as measured by expropriation risk. There is also some weak evidence in favor of Demography, vis-à-vis the reciprocal of life expectancy at age 1.

4. Proximate versus Ultimate

Given that we found extremely little evidence of a direct link between Religiosity and growth, in this section, we investigate whether there is evidence for an indirect relationship between Religiosity and growth through proximate variables.

We first consider the set of proximate variables that correspond to those typically employed in the canonical Solow growth regression; i.e., investment, schooling, population growth, and initial income. We carry out BMA regressions on each of the Solow variables on the three period dummies, Religiosity, Religion Shares, the other fundamental determinants, regional heterogeneity and initial income[6]. We present our results in Table 8 (columns 1-4). These results were obtained using the hierarchical priors and BIC information criterion[7] as described in the Technical Appendix. Table 9(a) presents the posterior probability of theory inclusion results for these Solow variables.

[6] Except for the case where the dependent variable is initial income, then this variable is dropped from the right hand side.

[7] To investigate the robustness of our findings we obtained results (not reported) under the AIC information criterion and uniform priors. Our baseline findings are largely robust to these alternatives.

Our main finding is that none of the Religiosity variables are significant for any of the Solow variables[8]. Nevertheless, the Religiosity variables may matter "collectively" for population growth as suggested by the high posterior probability of theory inclusion. This probability is close to 1 for population growth while it is negligible for the other Solow variables (especially given that the prior for this probability was set to 0.5). This result suggests that while it is highly likely that Religiosity is a legitimate explanatory theory of population growth, nevertheless, its expected quantitative effect, once we account for model uncertainty, is likely to be inconsequential.

In terms of the Religion Shares we find evidence that Religion Shares influence population growth and income but there is no evidence that they affect investments or schooling. The posterior probability of inclusion for Religion Shares as a theory is close to 1 for both population growth and initial income, about 0.58 for investments, and only 0.08 for schooling. More precisely, we find that the Jewish share is positively significant at the 1% level as a determinant of population growth. There is also strong evidence at the 1% significance level that the Muslim and Hindu shares are negatively related to initial income[9].

The evidence for the effect of other fundamental determinants on Solow proximates is richer. First, at least "collectively" we find that Regional Heterogeneity is primarily important for schooling and, to a lesser degree, also for investments and initial income. Specifically, the East Asia dummy is positive and statistically significant at 1% for both investments and schooling. The Sub-Saharan African dummy is only important in the initial income equation. Initial income appears to be important for investments and especially schooling. Particularly, initial income is positive and statistically significant at 1% in the schooling equation.

---

[8] We do find, however, that some Religiosity variables are significant when we employ either uniform model priors in place of hierarchical priors or use the AIC as an alternative to the BIC approximation. Specifically, belief in heaven appears to be positively and significantly (at the 5% level) correlated with population growth rates, while monthly church attendance appears to be negatively and significantly (at the 5% and 10% levels) correlated with them as well.

[9] The evidence for Eastern religion and Protestant share is less robust as they are positively related to initial income (at the 1% level) only for the case of hierarchical priors and AIC.

Geography appears to have an effect on population growth and initial income. KGATRSTR (i.e., climate) positively affects both population growth and initial income at 1%, while LCR100km (i.e., geographic isolation) only affects initial income (negative and statistically significant at 5%). Fractionalization appears to be a rather weak theory in terms of its effect on the Solow variables. We find that the coefficient to Language is positive and statistically significant at 1% in the population growth and initial income equations only when we replace our BIC approximation with AIC. In contrast, the impact of institutions on the Solow variables is as large and important as its direct impact on growth. We find that Property Rights, as measured by Expropriation Risk, negatively affect both population growth and investments (at the 1% level), while Contracting Institutions, as measured by Check, negatively affects schooling (at the 1% level)[10]. In contrast, the evidence for an important role for Political Rights appears to be comparatively weaker. Political Rights and its square are only statistically significant in the initial income equation but the evidence is not robust for different priors or information criteria. Nevertheless, the posterior probability for inclusion of Political Rights, as a theory, is close to 1 in the initial income equation.

We now turn our attention to the non-Solow proximate determinants; i.e., the reciprocal of life expectancy at age 1, the logarithm of fertility rate, openness (filtered), government consumption (net), growth rate of the terms of trade interacted with the ratio of exports plus imports to GDP, and the inflation rate. Please refer to tables 8 (columns 5-10) and 9(b) for the corresponding results.

The results for Religiosity are more interesting for this case. We find that belief in heaven exerts a positive and significant (at the 1% level) influence on log fertility rate and government consumption, while belief in hell has a negative and significant (also at the 1% level) impact on government consumption. Monthly church attendance is not significant for any of these proximate determinants. Nevertheless, Religiosity, as a theory, appears to be important for fertility, government consumption, as well as openness. As shown in table 9(b), the probability of theory inclusion for Religiosity in each of these cases is very high; much larger than the 0.5 prior. Nevertheless, none of the

[10] These results for institutions are robust for both uniform and hierarchical priors as well as for both BIC and AIC.

individual Religiosity variables themselves are significant for either openness or the inflation rate – the two variables that were shown to be robust determinants of growth in section 3 above.

Religion Shares appear to be important for determining government consumption. Countries with higher shares of Hindu and Protestant adherents tend to have significantly higher levels of government consumption. Countries with higher Hindu shares also appear to experience significantly higher rates of mortality (as measured by the reciprocal of life expectancy at age 1). Table 9(b) also shows that Religion Shares, as a theory, appears to be important for fertility. The posterior probability of theory inclusion for Religion Shares is 0.63 which is larger than the 0.5 prior. Nevertheless, none of the religion shares themselves appear to have a significant effect on log fertility rates suggesting that the expected quantitative effect of this theory, once model uncertainty is accounted for, is minimal.

In terms of the effects of the other fundamental growth determinants on these non-Solow proximate determinants, we find that more tropical areas (in terms of KGATRSTR) have a significantly higher (at the 1% level) mortality rate (as measured by the inverse of life expectancy at age 1). However, they also have significantly higher (log) fertility rates. We also find that countries with better Property Rights institutions (as measured by Expropriation Risk) have significantly lower inflation and enjoy significantly higher levels of trade openness. Trade openness is also positively and significantly (at the 1% level) influenced by greater geographic accessibility (as measured by LCR100KM). This finding is consistent with the existing literature suggesting landlockedness is detrimental to trade integration (see, Radelet and Sachs (1998) and Frankel and Romer (1999)). We remind the reader that in Table 4, we found that conditional on trade openness, accessibility is negatively associated with growth, so that this channel helps explain the overall positive correlation between accessibility and growth that is part of the conventional wisdom on growth determinants. Surprisingly, we also find that higher levels of ethnic fractionalization may result in higher levels of trade openness.

Overall, the analysis of the indirect relationship between proximate growth determinants and the fundamental growth theories reveals that Religiosity is unlikely to

have an important indirect effect on growth. Religiosity simply does not appear to matter to the robust proximate growth determinants identified in section 3; i.e., initial income, openness, inflation, and (to a lesser extent) life expectancy. Beliefs appear to be strongly important for government consumption but the latter was not identified as a robust growth determinant. We do not uncover a critical role for Religion Shares either. The one possible exception is its role in determining initial income (Hindu, Muslim, and Protestant).

5. Conclusion

In this paper, we evaluate the robustness of the link between religion and economic performance using Bayesian model averaging methods to account for model uncertainty. In sharp contrast to existing work in the literature, we find no evidence that the degree of *religiosity* is quantitatively important to growth. There is no evidence that religious beliefs (such as beliefs in the existence of hell or heaven) have a direct robust relationship with economic growth. The effect of monthly church attendance on growth, however, is robust, significant, and, importantly, negative. We further investigate whether there may be indirect effects of religion on economic growth through proximate growth determinants. We find no evidence to suggest that monthly church attendance and religious beliefs have such indirect effects through the set of proximate determinants that are shown to be robustly correlated with growth. Finally, our collective findings lead us to conclude that there is very little in the data to support the contention that a country's economic performance has anything whatsoever to do with the efficiency of its religious sector in generating beliefs.

We conclude by noting that it is difficult to overstate the stakes in the outcome of the current debates on religion's role in economic performance. The advocacy value of this new area of work owes in no small measure to its potential for (mis-)application to important and ongoing public policy controversies. Justified or not, results from the empirical analysis of the religion/growth nexus will provide ammunition to proponents of various policy positions that are still controversial in contemporary discussions. Getting

the empirics right on this matter is therefore of first-order importance. We view this paper as a first step in that direction.

Bibliography

Acemoglu, D., S. Johnson and J. Robinson (2001), "The Colonial Origins of Comparative Development: An Empirical Investigation", *American Economic Review* 91(5):1369-1401.

Acemoglu, D., S. Johnson and J. Robinson (2002), "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution", *Quarterly Journal of Economics* 117(4):1231-1294.

Acemoglu, D and S. Johnson (2005), "Unbundling Institutions", *Journal of Political Economy*, 113(5), 949-995.

Acemoglu, D., S. Johnson and J. Robinson (2006), "Institutions as the Fundamental Cause of Long-run Growth," *Handbook of Economic Growth*, P. Aghion and S. Durlauf, eds., Amsterdam: North Holland.

Alesina, A., A. Devleeschauwer, W. Easterly, S. Kurlat and R. Wacziarg, (2003), "Fractionalization," *Journal of Economic Growth*, 8, 2, 155-194.

Barrett, D.B. (1982). *World Christian Encyclopedia*, 1st ed., Oxford, Oxford U. Press.

Barrett, D.B., G.T. Kurian, and T.M. Johnson (2001). *World Christian Encyclopedia*, 2nd ed., Oxford, Oxford University Press.

Barro, R., (1996), "Democracy and Growth." *Journal of Economic Growth,* 1(1).

Barro, R. and R. McCleary, (2003), "Religion and Economic Growth Across Countries," *American Journal of Sociology*, 68, 760-781.

Barro, R. and J.-W. Lee (1994). Data Set for a Panel of138 Countries, National Bureau of Economic Research.

Barro, R. and X. Sala-i-Martin, (2003), *Economic Growth*, Second edition, Cambridge: MIT Press.

Brock, W. and S. Durlauf, (2001), "Growth Empirics and Reality," *World Bank Economic Review*, 15, 2, 229-272.

Brock, W., K. West, and S. Durlauf, (2003), "Policy Analysis in Uncertain Economic Environments (with discussion)." *Brookings Papers on Economic Activity*, 1, 235-322.

Brown, P.J., M. Vannucci, and T. Fearn, (1998), "Multivariate Bayesian Variable Selection and Prediction," *Journal of the Royal Statistical Society*, Series B, 60 (3), 627-641.

Brown, P.J., M. Vannucci, and T. Fearn, (2002), "Bayes Model Averaging with Selection of Regressors," *Journal of the Royal Statistical Society*, Series B, 64 (3), 519-536

Candolo, C., A. Davison and C. Demétrio (2003) "A Note on Model Uncertainty in Linear Regression," *Journal of the Royal Statistical Society, series* D, 53, 2, 165-177.

Cavalcanti, T., S. Parente, and R. Zhao (2004), "Religion in Macroeconomics: A Quantitative Analysis of Weber's Thesis," mimeo, University of Chicago.

Cogley, T. and T. J. Sargent, (2005), "The conquest of US inflation: Learning and robustness to model uncertainty," *Review of Economic Dynamics*, Academic Press for the Society for Economic Dynamics, 8 (2), 528-563.

Doppelhofer, G., R. Miller and X. Sala-i-Martin, (2004), "Determinants of Long-term Growth: a Bayesian Averaging of Classical Estimates (BACE) Approach," *American Economic Review*, 94, 4, 813-835.

Easterly, W. and R. Levine, (2003), "Tropics, Germs, and Crops: How Endowments Influence Economic Development," *Journal of Monetary Economics*, 50, 3-39.

Easterly, W. and R. Levine, (1997), "Africa's Growth Tragedy: Policies and Ethnic Divisions", *Quarterly Journal of Economics*, 112 (4), p.1203-50.

Fernandez. C., E. Ley and M. Steel, (2001), "Model Uncertainty in Cross-Country Growth Regressions," *Journal of Applied Econometrics*, 16, 5, 563-76.

Garratt, A., K. Lee, M. H. Pesaran, Y. Shin, (2003), "Forecasting Uncertainties in Macroeconometric Modelling: An Application to the UK Economy," *Journal of the American Statistical Association*, 98 (464), 829–838.

George, E. I., (1999), "Discussion of Bayesian Model Averaging and Model Search Strategies by M.A. Clyde," Bayesian Statistics 6, 175-77, Oxford.

Glaeser, E. L., R. LaPorta, F. Lopez-de-Silanes, (2004), *Do Institutions Cause Growth?*, Journal of Economic Growth, 9, 271-303.

Guiso, L., P. Sapienza, and L. Zingales, (2003), "People's Opium? Religion and Economic Attitudes," *Journal of Monetary Economics*, 50, 225-282.

Hansen, B., (2006), "Least Squares Model Averaging," University of Wisconsin, mimeo.

Hjort N. and G. Claeskens, (2003), "Frequentist Model Averaging Estimators," *Journal of the American Statistical Association*, 98, 464, 879-899.

Masanjala, W. and C. Papageorgiou (2004), "Rough and Lonely Road to Prosperity: A Reexamination of the Sources of Growth in Africa Using Bayesian Model Averaging", mimeo, Louisiana State University.

Noland, M., (2003), "Religion, Culture, and Economic Performance," IIE Working Paper Series WP03-8, Institute for International Economics.

Raftery, A., D. Madigan, J. Hoeting, (1997), "Bayesian model averaging for linear regression models," *Journal of the American Statistical Association*, 92 (437), 179–191.

Rodrik, D., A. Subramanian, and F. Trebbi, (2002), "Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development", NBER Working Paper No. 9305.

Sachs, J., (2003), "Institutions Don't Rule: Direct Effects of Geography on Per Capita Income", NBER Working Paper No. 9490.

Tan, C. M., (2005), "No One True Path: Uncovering the Interplay between Geography, Institutions, and Fractionalization in Economic Development", Tufts University, Dept. of Economics Working Paper No. 2005-12.

Technical Appendix

a. model priors

As evident from equation (4) in the text, model averaging requires one to specify priors over the models in the model space M. This turns out to be a nontrivial task. At first glance, it would appear reasonable that if a researcher does not have any a priori information to distinguish between models, she should assign equal prior weights to each model. This is, in fact, the standard practice in the literature; i.e., where there is uncertainty over which of the *p* regressors in M are present, each of the 2^p models in the model space is assigned probability 2^{-p}. This is equivalent to assuming that the prior probability that a given variable is present in the "true" model is 0.5 independent of the presence or absence of any of the other *p* regressors in the model. And in fact this prior is the most commonly used one in the model averaging literature.

This uniform prior across models, however, ignores interrelations between different variables. As argued in Brock and Durlauf (2001) and Brock, Durlauf and West (2003), the probability that one variable affects growth may be logically dependent on whether others do. They describe this phenomenon as being analogous to the irrelevance of independent alternatives (IIA) in the discrete choice literature. Why is the IIA problem of particular importance in the growth context? An important consideration in the growth literature has been to evaluate the relative importance of various fundamental growth *theories*. Our primary concern, in this paper, for instance, is to evaluate claims that religion is important to growth. Therefore, in principle, what a researcher would want to do is to start by being agnostic about the a priori validity of fundamental growth theories, and then examine the posterior evidence in favor of or against each of these theories after viewing the data. However, if the uniform prior is employed, a researcher could arbitrarily increase or reduce the prior weights across *theories* simply by judiciously introducing "redundant" proxy variables for some of these theories.

To handle these interdependencies across theories created by the introduction of redundant variables, we set the prior probability that a particular *theory* – that is, the set of proxy variables classified under that theory – is included in the "true" model to 0.5 to reflect non-information across theories. This prior specification also assumes that theories

are independent in the sense that the inclusion of one theory in a model does not affect the probability that some other theory is also included.

Growth empirics also suffer from another problem which we refer to as *specification uncertainty*. In our context, this problem translates into concerns over what variables out of a potentially large set adequately proxies for each theory. New growth theories often do not naturally translate into specific regressors for a model such as (1). Rather, the theories are qualitative in the sense that multiple empirical proxies exist for each theory. Specification uncertainty results in dependencies between potentially irrelevant proxy variables *within* theories. If we ignore these dependencies by assigning uniform weights across all possible combinations of variables classified under each theory, then analogous to the discussion above, we would end up putting excess prior weights on many similar, but not very informative combinations while taking weight away from more unique and informative alternatives.

To deal with this problem, we introduce a version of George's (1999) *dilution priors*. Given that a theory T is a priori relevant, we assign to each possible combination of variables classified under this theory γ_T the following conditional prior probability,

$$\mu^D(\gamma_T) = \left|R_{\gamma_T}\right| \prod_{j=1}^{p_T} \pi_j^{\gamma_j} \left(1-\pi_j\right)^{1-\gamma_j}$$

where p_T is the number of proxy variables for theory T, $\pi_j = 0.5$ for $j = 1,..., p_T$, and R_{γ_T} is the correlation matrix for the set of variables included in γ_T. Since $|R_{\gamma_T}|$ goes to 1 when the set of variables are orthogonal and 0 when the variables are collinear, these priors are designed to penalize models with many "redundant" variables while preserving weights on unique and informative combinations. Figure 2 shows our model priors as represented by a hierarchical tree structure.[11]

[11]Other proposals to deviate from "flat" model priors have been advanced in the literature. For instance, Sala-i-Martin, Doppelhofer, and Miller (2004) alter the probability of variable inclusion in order to give greater weight to models with a small number of regressors. Brown, Vannucci, and Fearn (1998, 2002) assume that the probability a given variable is included is itself a random variable drawn from some distribution. This allows different variables to be included with different probabilities. However, the IIA assumption remains common to these approaches.

b. model posteriors and within-model posteriors

Our aim is to derive estimates and standard errors for the coefficients to the religiosity variables once uncertainty over models has been properly accounted for. That is, we seek to compute posterior moments of interest such as the posterior expectation and variance which are given by, respectively,

$$E(\beta_R \mid D) = \sum_{m \in M} E(\beta_R \mid D, m)\mu(m \mid D)$$

and,

$$Var(\beta_R \mid D) = \sum_{m \in M} Var(\beta_R \mid D, m)\mu(m \mid D) + \sum_{m \in M} \left(E(\beta_R \mid D, m) - E(\beta_R \mid D)\right)^2 \mu(m \mid D).$$

which require computing posterior model probabilities. To do this, we follow Raftery (1995) and approximate the log of the likelihood $\mu(D \mid m)$ in equation (4) of the text with the BIC. For robustness, we will also alternatively employ the AIC adjustment. We also follow Raftery's suggestion and replace $E(\beta_R \mid D, m)$ with the MLE estimator, $\hat{\beta}_{R,MLE,m}$.

This approach may also be interpreted as a Bayes/frequentist hybrid. Chipman, George, and McCulloch (2001) show that weighting models according to AIC or BIC is equivalent to a decision problem where Bayesian model averaging is carried out using priors over within-model parameters of the normal-inverse gamma form (calibrated to particular values) and uniform model priors, and where the objective is to minimize a general information criterion with a particular fixed penalty for complexity.

Finally, our method also allows for a simple strategy for assessing the posterior probability that a variable, a theory, or a joint set of theories is included in the "true" model. To do so, we simply sum up the posterior model probabilities conditional on one such event occurring; i.e., we compute, $\sum_{m \in M} \mu(m \mid D, m \in A)$ where A could be the event "belief in hell is included in the model" or "at least one Religiosity variable is included in the model", etc.

Data Appendix

Variable	Description	Source
Average Growth Rates of Real Per Capita GDP	Average growth rates for the periods 1965-74, 1975-84, and 1985-94.	Penn World Tables 6.1
Time Dummy Variables	Three dummy variables for 1965-74, 1975-84, and 1985-94.	
Regional Dummy Variables	A dummy variable for East Asia and a dummy variable for sub-Saharan.	
Initial Income	Logarithm of per capita GDP at 1965, 1975, and 1985. The instruments for initial income include the values at 1960, 1970, and 1980.	Penn World Tables 6.1
Population Growth Rates	Logarithm of average population growth rates plus 0.05 for the periods 1965-74, 1975-84, and 1985-94. The instruments for population growth rates include the average values of 1960-65, 1970-75, and 1980-85.	ibid
Investment Share	Average ratios over each period of investment to GDP for the periods 1965-74, 1975-84, 1985-94. The instruments for investments include the average values of 1960-65, 1970-75, and 1980-85.	ibid
Schooling	Years of male secondary and higher school attainment in 1965, 1975, and 1985.	Barro and Lee (2000)
Population Growth Rates	Logarithm of average population growth rates plus 0.05 for the periods 1965-74, 1975-84, and 1985-94. The instruments for population growth rates include the average values of 1960-65, 1970-75, and 1980-85.	Penn World Tables 6.1
1/ Life Expectancy at age 1	Reciprocals of life expectancy at age 1 in 1960, 1970, and 1980	Barro and Lee (1994), World Bank
Log of Fertility Rate	The log of the total fertility rate in 1960, 1970, and 1980	Barro and Lee (1994), World Bank, UNCDB
Openness (filtered)	Average ratios for each period of exports plus imports to GDP, filtered for the usual relation of this ratio to the logs of population and area for the periods 1965-74, 1975-84, and 1985-94. The instruments for this variable include the average values of 1960-65, 1970-75, and 1980-85.	Barro and McCleary (2003)
Government Consumption (net)	Average ratios for each period of government consumption (net of outlays on defense and education) to GDP.	Barro and Lee (1994), PWT61, GFS, SIPRI, UNESCO.
Change in Terms of Trade times Openness	The growth rate of the terms of trade over each period, interacted with the average ratio of exports plus imports to GDP	Barro and Lee (1994), World Bank
Inflation	The consumer price inflation rate for the periods 1965-74, 1975-84, 1985-94.	Barro and Lee (1994), IFS, Global Development Network Growth Database.

Variable	Description	Source
Belief in Hell	Fraction of the population who believe in hell expressed in the form of $\log(x/1-x)$.	World Values Surveys (1981–1984, 1990–1993, 1995–1997) and International Social Survey Programme (1995 and 1998)
Belief in Heaven	Fraction of the population who believe in heaven expressed in the form of $\log(x/1-x)$.	Ibid
Monthly Church Attendance	Population averages of monthly church attendance expressed in the form of $\log(x/1-x)$.	Ibid
Buddhism	Buddhism share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion.	Ibid
Catholic	Catholic share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion.	World Christian Encyclopedia (1982)
Eastern Religion	Eastern Religion share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion. It includes Chinese Universists, Confucians, Neoreligionists, Shintos, and Zoroastrians (Parsis).	Ibid
Hindu	Hindu share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion. It includes Hindus, Jains and Sikhs.	Ibid
Jew	Jewish share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion.	Ibid
Muslim	Muslim share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion.	Ibid
Orthodox	Orthodox share in 1970 and 1980 expressed as a fraction of the population who expressed adherence to some religion.	Ibid
Other Religion	Other Religion share 1970 and 1980	Ibid
Protestant	Protestant share in 1970, 1980, and 1990 expressed as a fraction of the population who expressed adherence to some religion. It includes Protestants and Anglicans.	Ibid
KGATRSTR	Percentage of land area classified as tropical and subtropical via the in Koeppen-Geiger system.	The Center for International Development at Harvard University
LCR100km	Percentage of a country's land area within 100km of an ice- free coast.	The Center for International Development at Harvard University
Language	Measure of linguistic fractionalization based on data describing shares of languages spoken as "mother tongues".	Alesina, A., A. Devleeschauwer, W. Easterly, S. Kurlat, and R.

Variable	Description	Source
		Wacziarg (2003)
Political Rights and Political Rights Square	We calculated the average for each period of the Freedom House measure of democracy and its square. Notice that the average of 1972-74 appears in the data.	Freedom House
Rule of Law	The average of the Political Risk Services indicator of the rule of law (the value for 1982 or 1985 appears in the first two periods	International Country Risk Guide
Expropriation Risk	Risk of "outright confiscation and forced nationalization" of property. Rescaled, from 0 to 1, with a higher score indicating higher less risk of expropriation. For the first two periods of our sample, we use the average value of expropriation risk for 1982-84. For the third and fourth periods of our sample we use the average value 1985-1994 and 1985-97, correspondingly. Source: International Country Risk Guide	International Country Risk Guide
Legal Formalism: Check	Index of formality in legal procedures for collecting on a bounced check, rescaled from 0 to 1.	World Bank at http://www.doingbusiness.org
Religious Pluralism	This variable is defined as one minus the Herfindahl index – i.e. the probability that two randomly selected persons from the population would belong to different religions. This index can, therefore, be viewed as an indicator of religious pluralism or diversity. Specifically, the Herfindahl index is the sum of the squares of the population fractions belonging to each of nine major categories: Buddhist, Catholic, Hindu, Jewish, Muslim, Protestant, other Eastern religions, Orthodox, and other religions. We calculate the religious pluralism in 1970 and 1980 (1990 for Poland).	
State Religion	A dummy variable that indicates the presence of state religion in 1970	Barro and McCleary (2003)
Stage Regulation of Religion	A dummy variable that indicates the presence of state regulation in religion in 1970.	Barro and McCleary (2003)
Ex Colony of Spain or Portugal	Coded zero or one. One indicates that country was colonized by Spain or Portugal.	Barro and Lee (1994),
English Legal Origin (or Common Law countries)	Coded zero or one. One indicates that country was colonized by Britain and English legal code was transferred.	La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999), and Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2003).

Figure 1a: Density Estimate for the Coefficient of Church Attendance

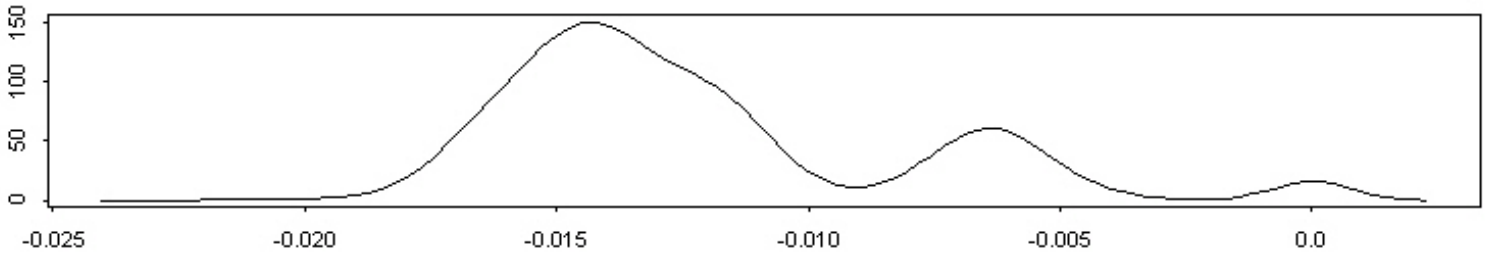

Figure 1b: Density Estimate for the Coefficient of Belief in Hell

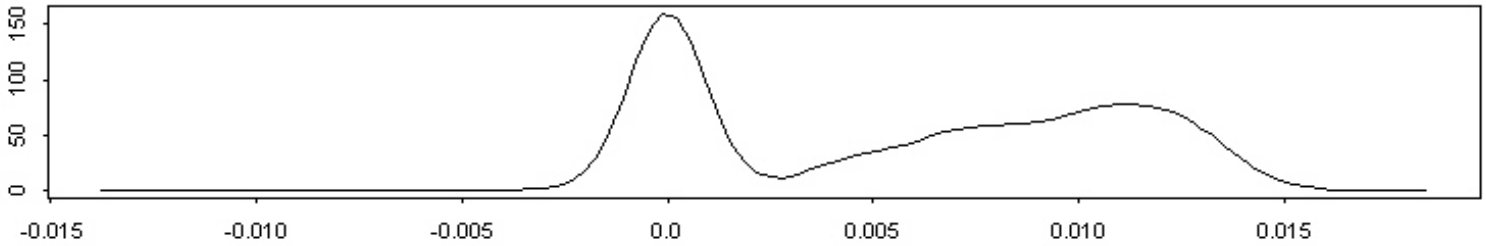

Figure 1c: Density Estimate for the Coefficient of Belief in Heaven

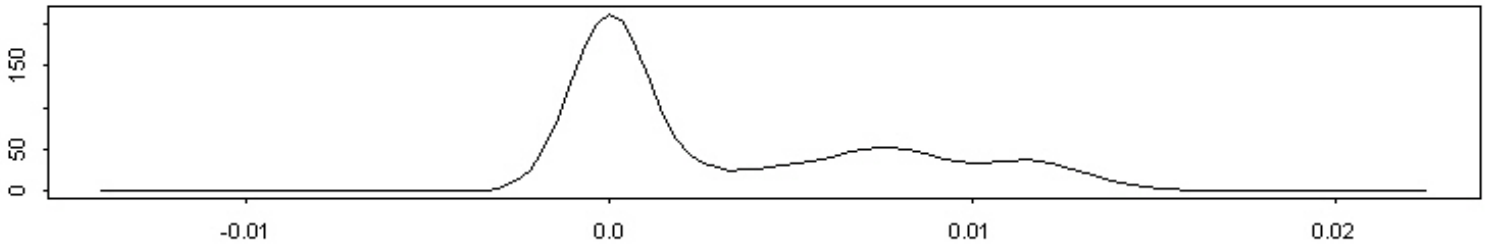

Figure 2: Hierarchical Model Priors

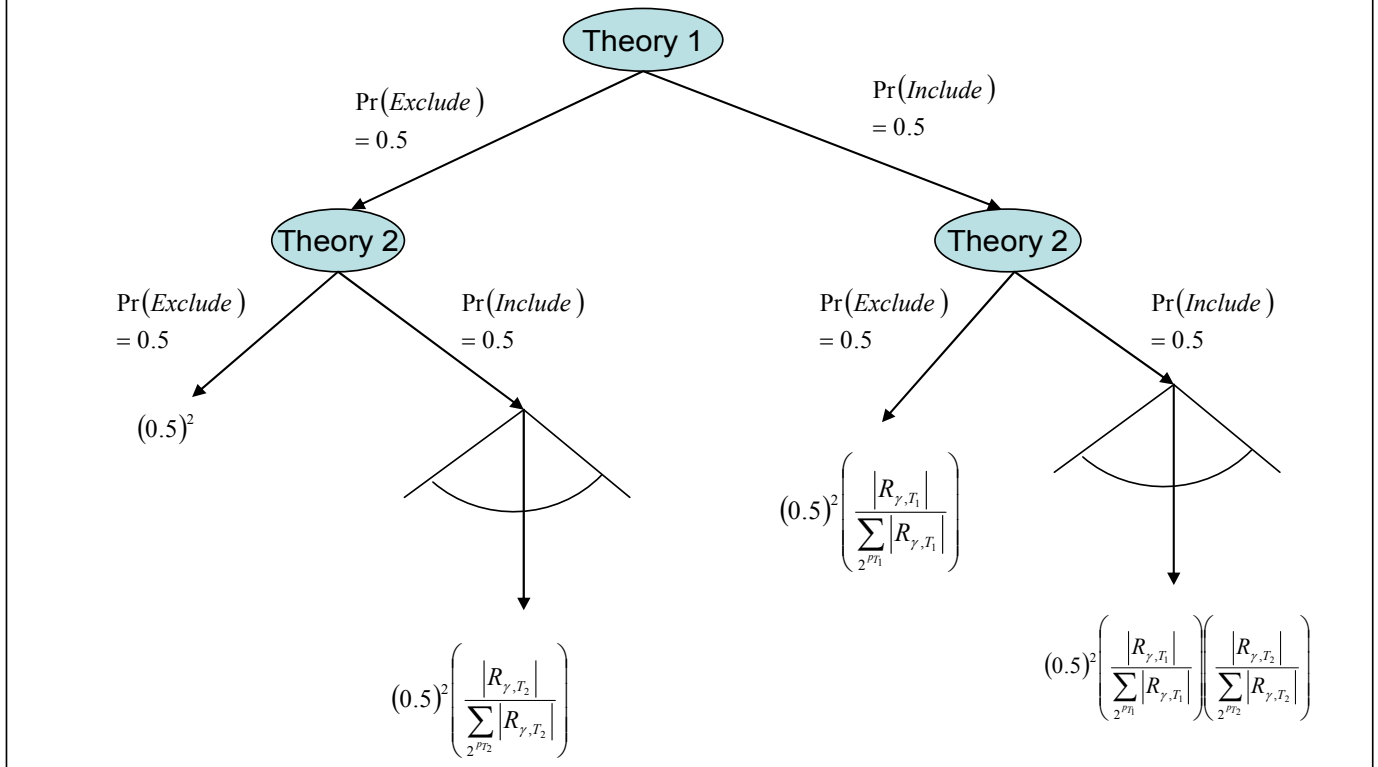

Table 1: List of Countries

Code	Country	Code	Country
	North America		*Asia and Oceania*
CAN	Canada	AUS	Australia
USA	United States	IND	India
		BGD	Bangladesh
	Europe	JPN	Japan
AUT	Austria	KOR	Korea, Rep.
BEL	Belgium	NZL	New Zealand
CY	Cyprus	PHL	Philippines
CHE	Switzerland	TWN	Taiwan, China
DEU	Germany, Fed. Rep. (former)		
DNK	Denmark		*Sub-Saharan Africa*
ESP	Spain	GHA	GHA
FIN	Finland	ZAF	ZAF
FRA	France		
GBR	United Kingdom		*Latin America & Caribbean*
HUN	Hungary	ARG	ARG
IRL	Ireland	BRA	BRA
ISL	Iceland	CHL	CHL
ISR	Israel	DOM	DOM
ITA	Italy	MEX	MEX
NLD	Netherlands	PER	PER
NOR	Norway		
POL	Poland		
PRT	Portugal		
SWE	Sweden		
TUR	Turkey		

Notes:

[1] 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.

[2] In our extended dataset Bangladesh, Cyprus, Germany, and Iceland were dropped from all three periods. Additionally, Poland was dropped from the first period and South Africa from the third period.

Table 2: Descriptive Statistics

Variable	Mean	Median	St. Dev.	Min.	Max.
East Asia	0.11110	0.00000	0.31573	0.00000	1.00000
Sub-Saharan Africa	0.04630	0.00000	0.21110	0.00000	1.00000
Average Growth Rates	0.02184	0.01916	0.01974	-0.02098	0.07864
Investments	0.22504	0.22290	0.06444	0.044800	0.37450
Schooling	2.11580	1.77100	1.30422	0.19400	5.9780
Initial Income	8.56522	8.71568	0.77955	6.62140	9.71534
1/ Life Expectancy at age 1	1.44483	1.38533	0.14140	1.30657	1.96941
Log of Fertility Rate	1.15628	1.05082	0.45017	0.43825	1.99470
Population growth Rates	-2.78022	-2.80616	0.14570	-3.06539	-2.48092
Openness (filtered)	-0.04213	-0.06195	0.17654	-0.47032	0.64087
Government Consumption (net)	0.07227	0.06495	0.04134	0.01000	0.23362
Change in Terms of Trade times Openness	-0.00290	-0.00264	0.01341	-0.05236	0.04734
Inflation	0.19376	0.08564	0.30464	0.01305	2.09233
Church Attendance	-0.36207	-0.40963	1.09993	-2.16432	2.09675
Belief in Hell	-0.57192	-0.45898	0.92632	-2.48382	1.75832
Belief in Heaven	0.50843	0.28033	0.99943	-1.43706	2.36583
Eastern Religion	0.06524	0.00000	0.22542	0.00000	0.96979
Hindu	0.02378	0.00000	0.13561	0.00000	0.827135
Jews	0.02920	0.00103	0.14670	0.00000	0.895643
Muslim	0.04163	0.00140	0.16485	0.00000	0.99299
Orthodox	0.00565	0.00201	0.00863	0.00000	0.03525
Other Religion	0.03564	0.00117	0.09363	0.00000	0.46940
Protestant	0.26133	0.03472	0.34640	0.00102	0.99595
LCR100km	0.60813	0.58210	0.31955	0.06325	1.00000
KGATRSTR	0.20300	0.00000	0.33765	0.00000	1.00000
Language	0.26552	0.15220	0.25130	0.00280	0.86520
Political Rights	0.77302	0.89420	0.27187	0.11666	1.00000
Political Rights Square	0.67079	0.79961	0.35652	0.01361	1.00000
Expropriation Risk	0.78119	0.85150	0.18187	0.31666	1.00000
Rule of Law	0.75470	0.83333	0.26923	0.16666	1.00000
Legal Formalism: Check	0.40274	0.35635	0.18219	0.09649	0.83479

Table 3: Replication of Table 4 in Barro and McCleary (2003a; ASR)

Explanatory Variable	System 1	System 2	System 3	System 4	System 5	System 6
Religiosity	0.00003[Υ]	0.00002[Υ]	0.00009[Υ]	0.00045[Υ]	0.00013[Υ]	0.00023[Υ]
Monthly Church Attendance	-0.00828*** (0.00183)	-0.01585*** (0.00341)	-0.00883*** (0.00209)	-0.01702*** (0.00442)	-0.00813*** (0.00207)	-0.01905*** (0.00453)
Belief in Hell	0.00659** (0.00263)	0.01527*** (0.00444)	-	-	0.00696** (0.00352)	0.00918* (0.00550)
Belief in Heaven	-	-	0.00534** (0.00270)	0.01460*** (0.00514)	-0.00053 (0.00359)	0.00942 (0.00631)
Religion Shares	-	0.00694[Υ]	-	0.00212[Υ]	-	0.00965[Υ]
Eastern Religion Share	-	-0.00711 (0.00839)	-	0.00345 (0.00803)	-	-0.00552 (0.00896)
Hindu Share	-	-0.01092 (0.01174)	-	0.00612 (0.01525)	-	0.00241 (0.01547)
Jewish Share	-	-0.00264 (0.00907)	-	0.00892 (0.00875)	-	0.00198 (0.00926)
Muslim Share	-	-0.03098** (0.01223)	-	-0.01400 (0.00979)	-	-0.02909** (0.01254)
Orthodox Share	-	-0.02966 (0.02044)	-	-0.02169 (0.01993)	-	-0.03289 (0.02091)
Protestant Share	-	-0.01661** (0.00698)	-	-0.02114** (0.00836)	-	-0.02144** (0.00868)
Other Religion Share	-	-0.01271 (0.02087)	-	-0.02160 (0.02317)	-	-0.02110 (0.02240)
Number of observations for each time period	38,41,39	38,41,39	38,41,39	38,41,39	38,41,39	38,41,39

This table replicates the growth regressions in Barro and McCleary (2003a; Table 4, page 773). The time periods are 1965– 1975, 1975–1985, and 1985–1995. Time dummies are included each period. The dependent variable is the growth rate of real per capita GDP over 1965–1975, 1975–1985, and 1985–1995. Other growth determinants were included but coefficients are not shown. The growth determinants not shown are the log of per capita GDP in 1965, 1975, and 1985; years of male secondary and higher school attainment in 1965, 1975, and 1985; reciprocal of life expectancy at age 1 in 1960, 1970, and 1980; average ratio over each period of investment to GDP; the log of the total fertility rate in 1960, 1970, and 1980; average ratios for each period of exports plus imports to GDP, filtered for the usual relation of this ratio to the logs of population and area; average ratios for each period of government consumption (net of outlays on defense and education) to GDP; the growth rate of the terms of trade over each period, interacted with the average ratio of exports plus imports to GDP; the average of the Political Risk Services indicator of the rule of law (the value for 1982 or 1985 appears in the first two equations); the average for each period of the Freedom House measure of political rights and its square; and the consumer price inflation rate for each period. The instrument list includes beginning of period or lagged values of all the covariates with the exception of church attendance, belief variables, and inflation. Inflation is instrumented with the Spain or Portuguese colonial dummy. The instruments for church attendance and belief variables are the dummy variables for state religion and state regulation of religion, and religious pluralism. Robust (White) standard errors are in parentheses. "***" denotes significance at 1%, "**" at 5%, and "*" at 10%. "Υ" denotes joint p-value.

Table 4: Classical and BMA Estimation Results

Explanatory Variable	LS BMA			2SLS BMA		
	Posterior Inclusion Probability	Posterior Mean and Std. Error	Classical LS	Posterior Inclusion Probability	Posterior Mean and Std. Error	Classical 2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Religiosity	0.83157[#]		0.00126[Y]	0.80270[#]		0.00000[Y]
Belief in Heaven	0.00057	0.00000 (0.00005)	0.00276 (0.00467)	0.00000	0.00000 (0.00005)	0.00941* (0.00520)
Belief in Hell	0.00511	0.00002 (0.00043)	0.00540 (0.00399)	0.00212	0.00001 (0.00026)	0.00394 (0.00481)
Monthly Church Attendance	0.83157	-0.00357* (0.00206)	-0.01002*** (0.00298)	0.80271	-0.00386* (0.00229)	-0.01613*** (0.00317)
Religion Shares	0.20143[#]		0.00000[Y]	0.19878[#]		0.00000[Y]
Eastern Religion Share	0.16462	0.00239 (0.00632)	-0.01924 (0.01180)	0.17147	0.00242 (0.00636)	-0.01477 (0.01240)
Hindu Share	0.00513	-0.00003 (0.00097)	-0.01075 (0.01609)	0.00491	-0.00003 (0.00096)	0.00052 (0.01707)
Jewish Share	0.02343	0.0004 (0.00279)	-0.00191 (0.01002)	0.02596	0.00043 (0.00292)	-0.00186 (0.00911)
Muslim Share	0.01638	-0.00013 (0.00152)	-0.03924*** (0.00899)	0.01095	-0.00007 (0.00107)	-0.04054*** (0.00943)
Orthodox Share	0.01948	-0.00398 (0.03844)	-0.56681*** (0.15851)	0.0146	-0.00273 (0.03269)	-0.40946*** (0.11566)
Protestant Share	0.06029	-0.00061 (0.00265)	-0.0162*** (0.00508)	0.04597	-0.00051 (0.00254)	-0.02161*** (0.00584)
Other Religion Share	0.00716	-0.00009 (0.00166)	-0.04497** (0.01886)	0.00701	-0.0001 (0.00167)	-0.04252** (0.02140)
Regional Heterogeneity	0.83895[#]		0.01552[Y]	0.83678[#]		0.41396[Y]
East Asia	0.83629	0.01311* (0.00789)	0.01812** (0.00834)	0.83381	0.01296 (0.00802)	0.00948 (0.00914)
Sub-Saharan Africa	0.00266	-0.00002 (0.00056)	-0.00196 (0.01102)	0.00298	-0.00003 (0.00060)	-0.00222 (0.01144)
Initial Heterogeneity	0.99999[#]		-	1.00000[#]		-
Initial Income	1.00000	-0.02899*** (0.00551)	-0.03481*** (0.00445)	1.00000	-0.02907*** (0.00570)	-0.03447*** (0.00438)
Gross Capital Accumulation	0.67447[#]		0.00212[Y]	0.63675[#]		0.00351[Y]
Investments	0.00585	-0.00006 (0.00209)	-0.04747** (0.02303)	0.00481	-0.00001 (0.00181)	-0.0236 (0.02466)
Schooling	0.67157	0.00169 (0.00157)	0.0033*** (0.00122)	0.6339	0.00158 (0.00155)	0.00453*** (0.00140)
Demography	0.87801[#]		0.03643[Y]	0.86232[#]		0.07683[Y]
Population Growth Rates	0.00000	0.00000 (0.00000)	0.01204 (0.02296)	0.00000	0.00000 (0.00000)	-0.02256 (0.01967)
1/ Life Expectancy at age 1	0.87801	-0.05365** (0.02737)	-0.05593** (0.02239)	0.86232	-0.05373* (0.02845)	-0.04481** (0.02077)
Log of Fertility Rate	0.00000	0.00000 (0.00000)	-0.01211 (0.00842)	0.00000	0.00000 (0.00000)	-0.00404 (0.00813)

Table 4 (Cont'd) : Classical and BMA Estimation Results

Explanatory Variable	LS BMA		Classical LS	2SLS BMA		Classical 2SLS
	Posterior Inclusion Probability	Posterior Mean and Std. Error		Posterior Inclusion Probability	Posterior Mean and Std. Error	
	(1)	(2)	(3)	(4)	(5)	(6)
Macroeconomic Policy	0.99999#		0.00000Υ	1.00000#		0.00000Υ
Openness (filtered)	0.99743	0.02484*** (0.00812)	0.02726*** (0.00740)	0.9971	0.02502*** (0.00838)	0.02761*** (0.00828)
Government Consumption (net)	0.7571	-0.09151 (0.05948)	-0.08701* (0.04522)	0.73394	-0.0913 (0.06190)	-0.0929* (0.04963)
Change in Terms of Trade times Openness	0.04899	0.00659 (0.03413)	0.13642** (0.05781)	0.05287	0.00707 (0.03533)	0.08798 (0.05611)
Inflation	0.93884	-0.01123** (0.00438)	-0.0175*** (0.00391)	0.92705	-0.01265** (0.00531)	-0.02138*** (0.00596)
Geography	0.88315#		0.00000Υ	0.86916#		0.00111Υ
LCR100km	0.88248	-0.01290** (0.00619)	-0.02499*** (0.00440)	0.86719	-0.01311** (0.00656)	-0.01909*** (0.00522)
KGATRSTR	0.00176	-0.00001 (0.00026)	-0.01025* (0.00549)	0.00292	-0.00001 (0.00038)	-0.00732 (0.00660)
Fractionalization	0.99999#		-	1.00000#		-
Language	1.00000	-0.01975*** (0.00606)	-0.02075*** (0.00636)	1.00000	-0.01974*** (0.00614)	-0.01393** (0.00640)
Political Institutions	0.00000#		0.74802Υ	0.00116#		0.87249Υ
Political Rights	0.00000	0.00000 (0.00000)	0.02216 (0.02909)	0.00058	0.00000 (0.00018)	0.01333 (0.02891)
Political Rights Square	0.00000	0.00000 (0.00000)	-0.01832 (0.02449)	0.00059	0.00000 (0.00017)	-0.01234 (0.02441)
Property Rights Institutions	0.99999#		0.00098Υ	1.00000#		0.00698Υ
Expropriation Risk	1.00000	0.05708*** (0.01368)	0.07341*** (0.01998)	1.00000	0.05513*** (0.01426)	0.06932*** (0.02208)
Rule of Law	0.05075	-0.00133 (0.00608)	-0.0201* (0.01176)	0.04024	-0.00107 (0.00551)	-0.02231* (0.01190)
Contracting Institutions	0.00397#		-	0.00383#		-
Legal Formalism: Check	0.00398	0.00001 (0.00052)	-0.02943*** (0.00995)	0.00384	0.00002 (0.00063)	-0.01621 (0.01193)

Table 4 shows classical LS (Column 3), classical 2SLS (Column 6), LS BMA (Cols 1 and 2), and 2SLS BMA (Cols 4 and 5) results for the growth regression in eq. (1) of the text. 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 5: Min, Max, and Max Rule Coefficients

Religiosity Variable	Min Coefficient			Max Coefficient			Max Rule (max. coefficient + 2 std. errors)		
	Monthly Church Attendance (1)	Belief in Hell (2)	Belief in Heaven (3)	Monthly Church Attendance (4)	Belief in Hell (5)	Belief in Heaven (6)	Monthly Church Attendance (7)	Belief in Hell (8)	Belief in Heaven (9)
LS									
Monthly Church Attendance	-0.01466*** (0.00292)	-0.00496* (0.00295)	0.00000 (0.00000)	-0.00127 (0.00114)	-0.01152*** (0.00233)	-0.01314*** (0.00323)	-0.00163 (0.00215)	-0.01054*** (0.00143)	-0.01189*** (0.00204)
Belief in Hell	0.00217 (0.00473)	-0.00686* (0.00389)	0.00616 (0.00432)	0.00000 (0.00000)	0.01094*** (0.00308)	-0.00078 (0.00436)	0.00366 (0.00333)	0.01045*** (0.00192)	0.00000 (0.00000)
Belief in Heaven	0.01004** (0.00497)	0.00803 (0.00507)	-0.00856** (0.00390)	0.00000 (0.00000)	-0.00015 (0.00356)	0.01118** (0.00496)	-0.00314 (0.00393)	0.00000 (0.00000)	0.00923*** (0.00236)
2SLS									
Monthly Church Attendance	-0.02177*** (0.00278)	-0.01005*** (0.00313)	0.00000 (0.00000)	-0.00135 (0.00120)	-0.01495*** |(0.00216)	-0.02058*** (0.00297)	-0.00135 (0.00120)	-0.01293*** (0.00145)	-0.01559*** (0.00193)
Belief in Hell	0.00231 (0.00564)	-0.01100*** (0.00404)	0.00895* (0.00480)	0.00000 (0.00000)	0.01568*** (0.00278)	-0.00219 (0.00490)	0.00000 (0.00000)	0.01276*** (0.00191)	0.00000 (0.00000)
Belief in Heaven	0.01649*** (0.00508)	0.01618*** (0.00515)	-0.01084** (0.00423)	0.00000 (0.00000)	0.00000 (0.00000)	0.01936*** (0.00489)	0.00000 (0.00000)	0.00000 (0.00000)	0.01288*** (0.00221)

Columns (1)-(6) of this table reports the minimum/maximum LS and 2SLS coefficient estimates and standard errors for equation (1) with the smallest/largest coefficient estimates for each of the three religiosity variables out of all the models used in the Bayesian Model Averaging exercises of table 4. For instance, column (1) shows coefficient estimates and standard errors of Monthly Church Attendance, Belief in Hell, and Belief in Heaven that correspond to the model with smallest coefficient estimate for Monthly Church Attendance out of all the models used in the Bayesian Model Averaging exercises. Similarly, columns (8)- (9) reports the LS and 2SLS coefficient estimates and standard errors for equation (1) where the coefficient estimates for the three religiosity variables plus twice the standard error is largest for all the models used in the Bayesian Model Averaging exercises and reported in table 4. For instance, column (7) shows coefficient estimates and standard errors of Monthly Church Attendance, Belief in Hell, and Belief in Heaven that correspond to the model with largest coefficient estimate plus twice the standard error for Monthly Church Attendance out of all the models used in the Bayesian Model Averaging exercises. All the regressors and instruments that were in included in table 4 are also included here but not shown. Robust (White) standard errors are in parentheses. "***" denotes significance at 1%, "**" at 5%, and "*" at 10%.

Table 6: Posterior Mode Model

Explanatory Variable	LS	2SLS
Monthly Church Attendance	-0.00471*** (0.00135)	-0.00456*** (0.00147)
East Asia	0.01015** (0.00433)	0.01067** (0.00440)
Initial Income	-0.03237*** (0.00404)	-0.03053*** (0.00399)
Schooling	0.00388** (0.00157)	0.00309** (0.00148)
1/ Life Expectancy at age 1	-0.06538*** (0.01965)	-0.06173*** (0.01915)
Openness (filtered)	0.03271*** (0.00811)	0.02994*** (0.00824)
Government Consumption (net)	-0.04688 (0.03647)	-0.05487 (0.03508)
Inflation	-0.01356 (0.00407)	-0.02353*** (0.00769)
LCR100km	-0.00869** (0.00419)	-0.00988** (0.00436)
Language	-0.02426*** (0.00631)	-0.02565*** (0.00640)
Expropriation Risk	0.03596*** (0.01251)	0.03118** (0.01366)

This table shows the LS and 2SLS coefficient estimates and standard errors for the model that corresponds to the largest posterior model probability for all the models used in the Bayesian Model Averaging exercises and reported in table 4. 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%.

Table 7: Robustness

Priors	Hierarchical	Hierarchical	Hierarchical	Hierarchical	Hierarchical	Uniform	Hierarchical
Information Criterion	BIC	BIC	BIC	BIC	BIC	BIC	AIC
Always Kept	None	Barro and McCleary	Solow	Religiosity	Religiosity and Shares	None	None
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Religiosity	0.80270#	-	0.96698#	-	-	0.99862#	0.99978#
Belief in Heaven	0.00000	0.00862	0.00005	-0.00101	-0.00128	0.00005	0.00099
	(0.00000)	(0.00533)	(0.00048)	(0.00416)	(0.00499)	(0.00048)	(0.00292)
Belief in Hell	0.00001	0.0067	0.00006	0.00378	0.01001**	0.00029	0.00551
	(0.00026)	(0.00504)	(0.00060)	(0.00480)	(0.00458)	(0.00162)	(0.00568)
Monthly Church Attendance	-0.00386*	-0.01711***	-0.00494***	-0.00549***	-0.01134***	-0.00586***	-0.01033***
	(0.00229)	(0.00340)	(0.00175)	(0.00198)	(0.00363)	(0.00187)	(0.00385)
Religion Shares	0.19878#	-	0.03641#	0.06694#	-	0.95861#	0.97931#
Eastern Religion Share	0.00242	-0.01387	0.00000	-0.00001	-0.01761	0.00479	-0.01227
	(0.00636)	(0.00890)	(0.00047)	(0.00047)	(0.01449)	(0.00919)	(0.01541)
Hindu Share	-0.00003	0.00164	-0.00001	-0.00003	-0.01955	-0.00023	-0.00269
	(0.00096)	(0.01569)	(0.00037)	(0.00101)	(0.01662)	(0.00215)	(0.00855)
Jewish Share	0.00043	-0.01043	0.00019	0.00146	0.01016	0.00026	0.00088
	(0.00292)	(0.00980)	(0.00210)	(0.00603)	(0.00983)	(0.00222)	(0.00510)
Muslim Share	-0.00007	-0.04226***	-0.00001	-0.00013	-0.03334***	-0.00219	-0.02961*
	(0.00107)	(0.01145)	(0.00054)	(0.00182)	(0.01110)	(0.00597)	(0.01741)
Orthodox Share	-0.00273	-0.51519***	-0.00095	-0.00276	-0.31884	-0.04937	-0.42376*
	(0.03269)	(0.18219)	(0.01779)	(0.03088)	(0.20740)	(0.12068)	(0.22872)
Protestant Share	-0.00051	-0.02121***	-0.00038	-0.00016	-0.01787***	-0.00712	-0.01574**
	(0.00254)	(0.00617)	(0.00216)	(0.00161)	(0.00644)	(0.00659)	(0.00668)
Other Religion Share	-0.0001	-0.03925**	0.00000	-0.00006	-0.03879**	-0.00026	-0.01858
	(0.00167)	(0.01834)	(0.00039)	(0.00129)	(0.01942)	(0.00310)	(0.02081)

This table presents the posterior means and std. errors for the coefficients of the religiosity variables and religion shares for seven different modeling averaging exercises for the growth regression described in equation (1) of the text. The time periods are 1965– 1975, 1975–1985, and 1985–1995. Time dummies are included for each period. The dependent variable is always the growth rate of real per capita GDP over 1965–1975, 1975–1985, and 1985–1995. For all the exercises other growth determinants were included but coefficients are not shown. In fact we used the same set of determinants and instruments as in table 4. Columns (1)-(5) and (7) refer to BMA exercises using Hierarchical priors while exercise (6) refers to a BMA exercise using Uniform priors. Exercises (1)-(6) employed the BIC approximation while exercise (7) employed the AIC criterion. Finally, columns (1), (6), and (7) refer to BMA exercises that allowed for model uncertainty for all the variables. Column (2) corresponds to the exercise that assumed that the specification of Barro and McCleary is always kept (included) in all the models considered in the BMA. Column (3) assumed that the variables suggested by Solow (i.e. population growth, investments, schooling, and initial income) are always kept. Column (4) assumed that the religiosity variables are always kept while column (5) assumed that both religiosity and shares are always kept. Notice that column (1) is identical to column (5) of table 4. Posterior robust (White) standard errors are in parentheses. "***" denotes significance at 1%, "**" at 5%,. and "*" at 10%.

Table 8: Proximate Determinants on Ultimate Theories (2SLS estimates)

Variable	Population Growth	Investments	Schooling	Initial Income
	(1)	(2)	(3)	(4)
East Asia	-0.03216 (0.0624)	0.04875** (0.02111)	1.03445*** (0.25264)	-0.42540 (0.334300)
Sub-Saharan Africa	-0.0395 (0.07323)	0.00147 (0.01145)	-0.00423 (0.07556)	-0.70308* (0.41823)
Initial Income	0.00279 (0.01029)	0.00919 (0.01137)	0.96949*** (0.11894)	-
Belief in Heaven	0.06016 (0.03793)	0.00000 (0.00019)	0.00003 (0.01112)	-0.00028 (0.00534)
Belief in Hell	0.0165 (0.02806)	0.00000 (0.00000)	-0.00038 (0.01254)	0.00041 (0.00957)
Monthly Church Attendance	-0.03344 (0.02466)	-0.00003 (0.00061)	0.00293 (0.02315)	-0.00587 (0.02668)
Eastern Religion Share	0.05095 (0.08845)	0.00369 (0.01619)	-0.01120 (0.11609)	0.56135 (0.42649)
Hindu Share	0.0862 (0.09179)	-0.00718 (0.01983)	0.00376 (0.05351)	-2.06406*** (0.22430)
Jewish Share	0.27702*** (0.06708)	0.00078 (0.00593)	0.00079 (0.01886)	0.01223 (0.08021)
Muslim Share	0.00474 (0.0187)	0.00003 (0.00174)	-0.00517 (0.06487)	-0.79292*** (0.11138)
Orthodox Share	-0.30979 (0.74561)	0.00372 (0.08596)	1.70465 (6.57694)	0.59914 (1.96748)
Protestant Share	-0.01635 (0.03211)	0.00011 (0.00183)	0.03999 (0.17706)	0.28075* (0.14359)
Other Religion Share	0.03251 (0.09642)	-0.10476 (0.09541)	0.00591 (0.09961)	-0.44903 (0.72011)
LCR100km	-0.02277 (0.03779)	-0.00098 (0.00545)	-0.09574 (0.23019)	-0.28397** (0.13123)
KGATRSTR	0.17595*** (0.0284)	-0.0191 (0.02599)	0.00378 (0.04653)	-0.67506*** (0.14457)
Language	0.08548 (0.05724)	-0.02107 (0.02331)	0.06187 (0.18265)	0.30857 (0.22593)
Political Rights	-0.00023 (0.00539)	-0.00043 (0.00499)	0.00744 (0.15225)	0.10748*** (0.32666)
Political Rights Square	-0.00156 (0.01058)	-0.00200 (0.00948)	0.04297 (0.19635)	0.78508 (0.28502)
Expropriation Risk	-0.24403** (0.10835)	0.17761*** (0.04440)	-0.00167 (0.08300)	0.11916 (0.29865)
Rule of Law	0.03574 (0.07583)	0.00001 (0.00181)	-0.00333 (0.04822)	0.02827 (0.12183)
Legal Formalism: Check	-0.00067 (0.00962)	0.00346 (0.01437)	-2.09938*** (0.40801)	-0.00382 (0.06905)

Tables 8 presents 2SLS posterior means and std. errors for regressions of proximate on ultimate growth variables. The explanatory variables for all the regressions are the ultimate determinants (regional and initial heterogeneity, religiosity, religion shares, geography, fractionalization, political institutions, property rights, and contracting institutions). We also include time dummies. As in table 4 the instrument list includes the two regional dummies; real GDP per capita in 1960, 1970, and 1980 (for equations (1)-(9); 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; the value of Rule of Law in 1982 or 1985 and its average value for 1985-94. Religiosity variables are instrumented with the dummy variables for state religion and 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. All the BMA exercises employ Hierarchical priors and BIC approximation. Posterior robust (White) standard errors are in parentheses. "***" denotes significance at 1%, "**" at 5%, and "*" at 10%.

Table 8 (cont.): Proximate Determinants on Ultimate Theories (2SLS estimates)

Variable	1/ Life Expectancy at age 1	Log of Fertility Rate	Openness (filtered)	Government Consumption (net)	Change in Terms of Trade times Openness	Inflation
	(5)	(6)	(7)	(8)	(9)	(10)
East Asia	0.00652	-0.01196	-0.00022	0.00005	-0.00007	-0.00812
	(0.02227)	(0.04499)	(0.00770)	(0.00120)	(0.00076)	(0.03450)
Sub-Saharan Africa	0.20634***	-0.02473	-0.00058	0.00435	0.00002	-0.01945
	(0.03205)	(0.07517)	(0.01032)	(0.01019)	(0.00127)	(0.06817)
Initial Income	-0.07250***	-0.18704***	-0.00046	-0.03678***	0.00010	0.00673
	(0.01726)	(0.04315)	(0.00709)	(0.00593)	(0.00112)	(0.02600)
Belief in Heaven	0.00265	0.13388***	0.00133	0.03194***	0.00000	-0.00028
	(0.00615)	(0.03473)	(0.00814)	(0.00599)	(0.00020)	(0.00382)
Belief in Hell	0.00012	0.00149	-0.00055	-0.04378***	0.00001	-0.00014
	(0.00180)	(0.01379)	(0.00620)	(0.00664)	(0.00024)	(0.00340)
Monthly Church Attendance	-0.00002	-0.00407	0.02885	-0.00004	-0.00001	-0.00052
	(0.00112)	(0.02231)	(0.02334)	(0.00073)	(0.00019)	(0.00528)
Eastern Religion Share	-0.00797	-0.00547	0.00000	0.00018	0.00000	-0.00001
	(0.02787)	(0.04103)	(0.00000)	(0.00186)	(0.00000)	(0.00190)
Hindu Share	0.21938***	0.03450	0.00000	0.13633***	0.00000	-0.00004
	(0.07901)	(0.10618)	(0.00000)	(0.01998)	(0.00000)	(0.00230)
Jewish Share	-0.02604	0.27983	-0.00035	-0.00021	0.00000	0.00277
	(0.05008)	(0.23496)	(0.00832)	(0.00245)	(0.00000)	(0.03657)
Muslim Share	0.05647	0.00501	0.00000	0.00053	0.00000	-0.00008
	(0.04185)	(0.03099)	(0.00000)	(0.00381)	(0.00025)	(0.00416)
Orthodox Share	-0.00722	-4.51045	0.00000	-0.06595	0.00000	-0.00439
	(0.10133)	(4.30926)	(0.00000)	(0.19152)	(0.00000)	(0.17243)
Protestant Share	0.00163	-0.00593	0.00000	0.03010***	0.00000	-0.00012
	(0.00712)	(0.03430)	(0.00000)	(0.00850)	(0.00000)	(0.00420)
Other Religion Share	0.01885	0.00191	-0.00005	0.00438	0.00000	-0.00005
	(0.05761)	(0.06164)	(0.00363)	(0.01695)	(0.00024)	(0.00429)
LCR100km	-0.02810	-0.06424	0.14492***	0.00013	-0.00004	-0.08204
	(0.02743)	(0.08765)	(0.05165)	(0.00137)	(0.00062)	(0.11671)
KGATRSTR	0.10226***	0.35783***	0.00356	-0.00119	-0.00001	-0.00165
	(0.02234)	(0.07245)	(0.01746)	(0.00507)	(0.00101)	(0.03872)
Language	-0.00001	0.00319	0.22396***	-0.00008	-0.00031	-0.20048
	(0.00382)	(0.02993)	(0.06139)	(0.00232)	(0.00208)	(0.14622)
Political Rights	-0.00006	0.00066	-0.00327	0.00128	0.00562	0.00338
	(0.00470)	(0.01269)	(0.01954)	(0.00624)	(0.00804)	(0.02609)
Political Rights Square	-0.00049	0.00001	-0.00297	0.00198	0.00183	0.00137
	(0.00598)	(0.00945)	(0.01683)	(0.00685)	(0.00468)	(0.01595)
Expropriation Risk	-0.00643	-0.00345	0.55644***	0.00018	-0.00051	-0.80664***
	(0.02921)	(0.03782)	(0.11079)	(0.00320)	(0.00437)	(0.20952)
Rule of Law	-0.02623	-0.10829	0.00375	0.00024	-0.00222	-0.00445
	(0.04892)	(0.17022)	(0.02871)	(0.00248)	(0.00556)	(0.05003)
Legal Formalism: Check	0.00555	-0.00171	0.00345	-0.00025	0.00012	0.00735
	(0.02202)	(0.02675)	(0.02579)	(0.00358)	(0.00313)	(0.05160)

Table 9a: Posterior Probabilities of Theory for Solow Determinants on Ultimate Theories (2SLS)

Variable	Population Growth (1)	Investments (2)	Schooling (3)	Income (4)
Regional Heterogeneity	0.189845	0.46123	0.99999	0.79685
Initial Heterogeneity	0.29301	0.91577	0.99465	-
Religiosity	1.00000	0.00337	0.04485	0.06546
Religion Shares	0.99970	0.58488	0.08742	1.00000
Geography	1.00000	0.40109	0.19154	1.00000
Fractionalization	0.83425	0.53388	0.13800	0.72093
Political Institutions	0.06397	0.08500	0.10446	1.00000
Property Rights Institutions	0.99946	0.99999	0.03696	0.27684
Contracting Institutions	0.016373	0.10178	0.99999	0.03357

This table summarizes the posterior inclusion probabilities for the 2SLS-BMA exercises based on Hierarchical priors and BIC approximation for the regressions of population growth, investments, schooling, and initial income on the ultimate determinants reported in table 8. This probability is calculated as 1 minus the probability of non-inclusion for any variable that belongs to the theory in question. The time periods are 1965– 1975, 1975–1985, and 1985–1995. All the regressions include as explanatory variables, time dummies, East Asia, Sub-Saharan Africa, Belief in Heaven, Belief in Hell, Monthly Church Attendance, Eastern Religion Share, Hindu Share, Jewish Share, Muslim Share, Orthodox Share, Protestant Share, Other Religion Share, LCR100km, KGATRSTR, Language, Political Rights, Political Rights Square, Expropriation Risk, Rule of Law, and Check. The regressions of Population Growth, Investments, and Schooling (Columns (1)-(3)) also include Initial Income as an explanatory variable. The list of instruments is described in table 8.

Table 9b: Posterior Probabilities of Theory for Proximate Determinants on Ultimate Theories (2SLS)

Variable	1/ Life Expectancy at age 1	Log of Fertility Rate	Openness	Government Consumption	Change in Terms of Trade times Openness	Inflation
	(1)	(2)	(3)	(4)	(5)	(6)
Regional Heterogeneity	0.99999	0.1777	0.04095	0.23840	0.04438	0.13942
Initial Heterogeneity	0.99999	1.00000	0.05896	1.00000	0.10969	0.10593
Religiosity	0.24271	1.00000	0.72788	1.00000	0.03797	0.04545
Religion Shares	0.99999	0.62815	0.00243	1.00000	0.00072	0.00847
Geography	0.99982	0.99824	0.95947	0.07508	0.04153	0.41582
Fractionalization	0.01736	0.04103	0.99821	0.04180	0.08812	0.75313
Political Institutions	0.04667	0.02724	0.09390	0.17084	0.62937	0.05745
Property Rights Institutions	0.33624	0.34181	1.00000	0.05215	0.24724	1.00000
Contracting Institutions	0.12938	0.02593	0.041838	0.03334	0.08140	0.04159

This table summarizes the posterior inclusion probabilities for the 2SLS-BMA exercises based on Hierarchical priors and BIC approximation for the regressions of the reciprocal of life expectancy at age 1, log of the total fertility rate, openness (filtered), government consumption (net); the growth rate of the terms of trade times openness; and inflation on the ultimate determinants as reported in of table 8. This probability is calculated as 1 minus the probability of non-inclusion for any variable that belongs to the theory in question.. The time periods are 1965– 1975, 1975–1985, and 1985–1995. All the regressions include as explanatory variables, time dummies, Initial Income, East Asia, Sub-Saharan Africa, Belief in Heaven, Belief in Hell, Monthly Church Attendance, Eastern Religion Share, Hindu Share, Jewish Share, Muslim Share, Orthodox Share, Protestant Share, Other Religion Share, LCR100km, KGATRSTR, Language, Political Rights, Political Rights Square, Expropriation Risk, Rule of Law, and Check. The list of instruments is described in table 8.