



# Religion and Economic Performance

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**Summary.** — This paper investigates the relationship between religion and economic performance. In both cross-country and within-country regressions, the null hypothesis that religious affiliation is uncorrelated with performance can frequently be rejected (i.e., religion matters), though the regressions do not yield a robust pattern of coefficients with respect to particular religions. The results with respect to Islam do not support the notion that it is inimical to growth. On the contrary, virtually every statistically significant coefficient on Muslim population shares reported in this paper—in both cross-country and within-country statistical analyses—is positive. If anything, Islam promotes growth.

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## 1. INTRODUCTION

Abundant evidence affirms that religious belief affects a wide range of behavioral outcomes (Iannaccone, 1998), and religious activity can affect economic performance at the level of the individual, group, or country through at least two channels.<sup>1</sup> In the *Wealth of Nations*, Adam Smith argued that participation in religious sects could potentially convey two economic advantages to adherents (Anderson, 1988). The first could be as a reputational signal: while the poor might look alike to potential employers, lenders, and customers, membership in a “good” sect could convey a reduction in risk associated with the particular individual. Second, sects could also provide for extra-legal means of establishing trust and sanctioning miscreants in intragroup transactions, reducing uncertainty and improving efficiency, especially where civil remedies for failure to uphold contracts were weak. This interpretation is essentially contentless with respect to the actual nature of religious belief. Indeed, there is nothing necessarily unique about religious sects in this regard—the argument could apply to a wide range of voluntary associations or clubs.

In a second line of argumentation, most prominently associated with Max Weber, it is the content of religious belief that is essential. In *The Protestant Ethic and the “Spirit” of Capitalism*, Weber (1905/2002) contended that the

Protestant Reformation was critical to the rise of capitalism through its impact on belief systems.<sup>2</sup> Weber argued that the Calvinist doctrine of predestination and the associated notion of the “calling” were essential for transforming attitudes toward economic activity and wealth accumulation. The result was a “this-worldly asceticism,” which focused adherents on diligent, efficient economic activity, thrift, and nonostentatious accumulation of wealth, which he saw as the bedrock of modern capitalism. Eisenstadt (1968) subsequently proposed a weaker version of the thesis—that it was not the specific theology *per se* but rather the “transformative potential” of religion that could account for wholesale alterations in values, behaviors, and outcomes.

This paper is an attempt to empirically analyze the second, Weberian, line of argumentation, with a particular emphasis of the alleged

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impact of Islam, recognizing per Greif (1994), Lal (1998), and Kuran (2003a) that intermediating institutions may be the mechanism through which religious belief affects economic performance at the aggregate level (and that Weber may have gotten the historical particulars wrong).<sup>3</sup> Three sorts of evidence are brought to bear on this issue: cross-country data analysis for a large sample of countries over a period of decades; a similar analysis for a small group of countries for nearly a century; and finally analyses of subnational data for three multireligious, multiethnic countries.

## 2. CROSS-COUNTRY ANALYSIS

Until recently, with occasional exceptions (e.g., Lewis, 1955), economists have paid little attention to the potential impact of religious belief on economic performance. Recent economic literature has in certain respects reploughed the ground of earlier modernization theorists, much of it by making use of the World Values Survey data, but with a more informed notion of the role of institutions in intermediating values and affecting outcomes.<sup>4</sup>

LaPorta, Lopez-de-Silanes, Shleifer, and Vishny (1997) define Catholicism, Orthodox Christianity, and Islam as “hierarchical” religions, a characterization for which Guiso, Sapienza, and Zingales (2003) find some support in the responses in the World Values Surveys. LaPorta *et al.* found that “countries with more dominant hierarchical religions have less efficient judiciaries, greater corruption, lower-quality bureaucracies, higher rates of tax evasion, lower rates of participation in civic activities and professional associations, a lower level of importance of large firms in the economy, inferior infrastructures, and higher inflation” (LaPorta *et al.*, 1997, pp. 336–337). They did not find a robust relationship between hierarchy-dominant religions and infant mortality, educational achievement, and growth.

Extending this work using the World Values Survey data, Guiso, Sapienza, and Zingales find that Protestants, Catholics, and Hindus tend to be favorably disposed toward private ownership, while Muslims want significantly less private ownership. Protestants and Hindus alone accept the trade-off of greater income inequality for more growth, Jews and Muslims are opposed, and the results for other religions are statistically insignificant.<sup>5</sup> They interpret this finding as a vindication of Weber.

In a cross-country growth regression framework, Barro and McCleary (2003), analyzing data from 59, mostly developed, countries find that Hinduism, Islam, Orthodox Christianity, and Protestantism are negatively associated with per capita income growth relative to Catholicism, while Sala-i-Martin, Doppelhofer, and Miller (2004), in a larger sample of 88 countries, obtain the result that Islam, and in some specifications, Confucianism, are positively associated with per capita income growth relative to an excluded category apparently consisting of everyone except Confucians, Muslims, Buddhists, Protestants, Hindus, Catholics, and Orthodox Christians. Barro and McCleary (2003) also find that the intensity of belief (though not church attendance) is positively associated with per capita income growth while Sala-i-Martin, Doppelhofer, and Miller do not uncover any relationship between intensity of belief and per capita growth.

### (a) *Multivariate analysis*

The hypothesis that religious attitudes affect national economic performance is a testable proposition. The first step is to construct a model in which the hypothesis that religion matters can be nested. A standard production function in the neoclassical growth model can be written as  $Y = Ae^{\mu t} K^\alpha L^{1-\alpha}$ , where  $Y$  is the gross domestic product,  $K$  is the stock of human and physical capital,  $L$  is unskilled labor,  $A$  is a constant reflecting the technological starting point of each society, and  $\mu$  is the exogenous rate of technological change. As written, the aggregate production function is Cobb–Douglas with a capital (human and physical) share of  $\alpha$ . Rewritten in intensive (i.e., per capita) form, the model implies that the growth rate of per capita income will slow over time as the marginal product on capital declines, and that in a cross-section, poorer countries (with lower capital–labor ratios) will tend to grow more quickly than rich countries, conditional on the saving–investment rate.

For some time, economists have been troubled by the fact that the actual growth trajectories of national economies seem to contradict both implications of the model. The endogenous growth approach sought to explain the first empirical anomaly through various mechanisms that would temper the tendency of declining marginal returns to slow the growth rate of rich economies, and set off the now vast literature on the determinants of long-run

growth across countries and subnational jurisdictions. In addition to the accumulation of physical and human capital, attention has been focused on indicators of macroeconomic stability, trade openness, political institutions, and geography.

Solow (2001) questioned the role of the many right-hand-side variables that have been included in the long-run growth literature and instead argued for focusing on national differences in the level and growth of total factor productivity or TFP (i.e.,  $Ae^{u_t}$ ) across countries as the left-hand-side variable to be explained. The problem, of course, is that empirical estimates of TFP are themselves derived as the residuals from growth-accounting exercises, and can be very sensitive to assumptions about the underlying aggregate production function (Pack, 2001) and the measurement of inputs (Hsieh, 2002). Setting aside these operational issues, Solow (2001, p. 287) argues that nontechnological phenomena including “the security of contracts, the intensity of competition, and the respect for instrumental rationality as a mode of behavior” could have a major impact on resource allocation and hence TFP. Solow also takes issue with the implicit assumption of much of the empirical work, namely, that actual measured output is at or near potential, particularly in the case of poor countries, especially monocultural primary producers.<sup>6</sup> If these kinds of countries are included in the empirical analysis, then “droughts and pests” should be included in the right-hand-side variables.

#### (b) *Medium-run results*

A standard model of economic fundamentals is reported in the first two columns of Table 1. The dependent variables are an estimate of TFP growth for 1973–84 by Collins and Bosworth (1996); and real per capita income growth during 1970–90 derived from the Penn World Tables (see in Appendix A for further details). The regressors, defined in the Appendix A, include initial GDP per capita, investment share, government expenditure share, international trade openness, and educational attainment. In addition to these included regressors, a long list of other variables were tried but are not reported in the interest of parsimony.<sup>7</sup> The basic regressions were then analyzed for simultaneity, especially with regard to the accumulation of human capital and were re-estimated using instrumental variables (IV) estimators, though

admittedly it is difficult to come up with a good set of instruments in this case.<sup>8</sup> The null hypothesis of equality between the coefficients derived from the simple ordinary least squares and two-stage least squares IV regressions could never be rejected. A summary of these nonreported regressions is available on request.

In both regressions 1.1 and 1.2, initial GDP per capita, the starting point indicator, is negative and statistically significant—that is, the countries exhibit convergence conditional on the other variables. Similarly, the coefficient on the human capital indicator, average years of schooling, is positive and statistically significant in both regressions. As in Sala-i-Martin *et al.* (2004), trade openness (defined as exports plus imports as a share of GDP) is insignificant in both regressions, presumably reflecting the crudity of this measure, and perhaps the distinction between opening to international trade generating a one-time step increase in income as factors are reallocated according to comparative advantage versus an ongoing growth impact associated with greater openness.

Having estimated a standard model based on economic fundamentals, variables on religious affiliation in 1970 were then added to the standard model in regressions 1.3 and 1.4.<sup>9</sup> Seven categories of religious affiliation are distinguished: Catholic, Protestant, Orthodox Christians, Muslims, Jews, Hindus, and Buddhists.<sup>10</sup> The original source provides data at a finer level of disaggregation, but other religions tend to be either extremely small in terms of global membership (e.g., Baha'is), or are so completely concentrated in a single country that they act as a dummy for that country (e.g., Shintoism with respect to Japan), or are themselves heterogeneous catch-all categories (e.g., ethno-religions). These religions, together with atheists and the nonreligious, collectively make up the “other religions” category. They are omitted from the regression (i.e., are absorbed in the constant) and are the standard against which the included major world religions are judged.<sup>11</sup>

The hypothesis that the pattern of religious affiliation has no impact on economic performance (i.e., the coefficients on the religious variables are jointly equal to zero) can be rejected for both specifications, though in the case of the TFP specification (regression 1.3), none of the individual coefficients are statistically significant. In the regression on per capita growth rates (regression 1.4), the Jewish, Catholic, and Protestant population shares are

Table 1. *Economic and religious variables*

Independent variables	Dependent variables			
	(1.1) TFP 1973–84	(1.2) Growth 1970–90	(1.3) TFP 1973–84	(1.4) Growth 1970–90
Initial GDP per capita	–0.00049 (–2.65)**	–0.00033 (–3.73)*	–0.00044 (–2.32)**	–0.00025 (–2.76)*
Investment share	0.0475 (1.29)	0.07761 (3.13)*	0.02773 (0.73)	0.07005 (2.64)**
Government share	–0.02437 (–0.56)	–0.0223 (–0.91)	–0.04991 (–1.06)	–0.01898 (–0.75)
Openness	–0.0098 (–0.93)	–0.00468 (–0.66)	–0.01267 (–1.24)	–0.00442 (–0.63)
Education	0.57401 (2.20)**	0.51306 (3.40)*	0.73191 (2.51)**	0.63123 (3.93)*
Muslim	–	–	0.00549 (0.34)	–0.00876 (–0.78)
Hindu	–	–	0.01865 (0.75)	0.00444 (0.23)
Buddhist	–	–	–0.01031 (–0.41)	–0.00901 (–0.48)
Jewish	–	–	–0.00469 (–0.14)	–0.04356 (–1.75)***
Catholic	–	–	–0.01817 (–1.17)	–0.02722 (–2.58)**
Orthodox	–	–	0.03472 (1.33)	–0.02276 (–1.38)
Protestant	–	–	–0.03292 (–1.29)	–0.0376 (–2.62)**
Constant	–0.6336 (–0.64)	0.59961 (0.88)	0.61806 (0.35)	1.89688 (1.69)***
R <sup>2</sup>	0.16	0.27	0.40	0.43
F (all explanatory vars)	1.62	5.34*	2.10**	4.02*
F (religion vars only)	–	–	2.21***	2.51**
Number of observations	50	78	50	78

\* Significant at the 1% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 10% level.

negatively correlated with per capita income growth, conditional on economic fundamentals, relative to the excluded category. (Differences in the underlying country samples and sample periods may have as much to do with the differences in the regression 1.3 and 1.4 results as intrinsic differences in the specification of the dependent variables. See Table 9 for specification of the country samples.)

These results differ somewhat from previous results obtained by Barro and McCleary (2003) and Sala-i-Martin *et al.* (2004) (which themselves differ). There are a number of potential sources of divergence. First the samples differ: Barro and McCleary analyze data on 59, mostly developed, countries (a maximum

of 37 countries for any given time period) including only four predominately Muslim countries during 1981–99; the Sala-i-Martin, Doppelhofer, and Miller data are reportedly for 88 countries during 1960–96, though it is doubtful that this is a “balanced” panel (i.e., all countries, all time periods). The two studies condition on different sets of included variables and employ different estimation techniques that, in turn, differ from the models in Table 1. Barro and McCleary (2003) and Sala-i-Martin *et al.* (2004) examine per capita income growth exclusively; neither study examines total factor productivity growth per Table 1.<sup>12</sup>

With respect to the interpretation of the religion variables, Barro and McCleary treat

Catholicism as the excluded category and include an undefined category “Eastern religions;” the results reported in Table 1 are closer to those reported by Sala-i-Martin, Doppelhofer, and Miller, in that the excluded category is a broad range of “other” religions, though the comparison is not exact—Sala-i-Martin, Doppelhofer, and Miller treat Confucianism as a religion (technically it is not), and include Judaism in the excluded category. Mimicking Barro and McCleary by re-estimating the income growth regression together with church attendance, belief in heaven, and belief in hell as a system, one obtains the same sign and significance pattern of the coefficients in a bit more than half of the cases. A comparison of the three sets of results does not support the notion of a robust relationship between particular religions and economic performance at the national level.

To get a better sense of how the regressions in Table 1 fit the data, an indicator of outlying data points, the studentized residual, was generated for all observations. [The studentized residual can be interpreted as the *t*-statistic associated with a dummy variable added to the regression for that particular observation. As a rule of thumb, a studentized residual exceeding 2.0 in absolute value is notable (Belsley, Kuh, & Welsch, 1980).] Guyana was the only country in Table 1 with studentized residuals exceeding this threshold in all specifications. The predominately Muslim countries did not systematically deviate from the international norm. There was no pattern to the studentized residuals (i.e., they were not consistently above or below the regression line). There were occasional outliers (e.g., Jordan’s values exceeded 2.0 in regressions 1.1 and 1.3; Iran’s was less than  $-2.0$  in regression 1.3), but most countries lay near the regression line.

### (c) Long-term results

Typically, the national religious affiliation data change slowly as a function of differential birth rates among different groups, in- and out-migration, and conversion, with some notable exceptions: In South Korea, for example, the Christian share rose from less than 1% in 1900 to 18% in 1970 and 40% in 1990. In much of Sub-Saharan Africa, Christianity and Islam have made steady in-roads, eroding the ethno-religious share for centuries. In the regressions reported thus far, the sample period was determined by the availability of data. In the case of

the TFP regressions, this was determined by the existence of estimates for a considerable sample of countries for 1973–84. For per capita income growth, the sample period 1970–90 was essentially chosen as the optimal trade-off between maximizing the sample period and maximizing the cross-national sample size, especially for heavily Muslim countries for which the data pre-1970 are sparse. Indeed, one of the basic issues is how something as slowly changing as religious affiliation could explain variable national economic performance.

Table 1 regressions were re-estimated for the 1913–98 period using per capita income data on 34 countries from Maddison (2003).<sup>13</sup> In the absence of the conventional macroeconomic variables, the following regressors were assembled: Nobel Prize winners per capita prior to 1913, the Polity IV composite score of democracy and autocracy in 1913, national capital temperature and latitude, the 1900 urbanization rate, the landlocked dummy, and religious affiliation in 1900. Of the nonreligious explanators, only initial GDP per capita and latitude were ever statistically significant.

Two specifications are reported in Table 2, one with the religious adherence variables excluded (2.1) and one with them added (2.2). In specification 2.2, among the religious affiliation variables, the coefficients on the Buddhist and Christian population shares are positive and statistically significant, while the others are insignificant. No country had studentized residuals with absolute values exceeding 2.0 in both specifications, and no large studentized residuals were associated with Muslim majority countries.

### 3. IS ISLAM A DRAG ON GROWTH?

Today Muslims are relatively poor, whether the comparison is done to the worldwide mean at either the individual (Bhalla, 2002) or national (Kuran, 2004b) level, and there is a long line of scholarship that ascribes this state of affairs to Islam itself.<sup>14</sup> In principle, the existence of uniquely Islamic economic practices or institutions such as the prohibition on *riba*, commonly believed to be equivalent to the charging of interest, or the injunction to observe *zakat*, narrowly construed as the paying of alms, could serve as the causal links between theological belief and economic performance at the aggregate level.<sup>15</sup> On the basis of their analysis of World Values Survey data, Guiso

Table 2. *Long-run economic and religious variable regressions*

Independent variables	Dependent variables	
	(2.1) Growth 1913–98	(2.2) Growth 1913–98
Initial GDP per capita	–0.00018 (–2.49)**	–0.00023 (–3.00)*
Latitude	0.01143 (1.33)	0.01662 (1.92)***
Nobels per capita, 1901–12	339536.50318 (0.69)	–17603.27949 (–0.03)
Polity	0.00196 (0.10)	–0.00039 (–0.02)
Muslim	–	0.00515 (0.89)
Hindu	–	0.01488 (0.06)
Buddhist	–	0.01894 (3.12)*
Jewish	–	–0.11017 (–1.60)
Catholic	–	0.01009 (2.02)**
Orthodox	–	0.01469 (2.08)**
Protestant	–	0.01122 (1.77)***
Constant	1.90373 (7.03)*	1.00735 (1.87)**
$R^2$	0.22	0.61
$F$ (all explanatory vars)	2.06	3.07***
$F$ (religion vars only)	–	3.07**
Number of observations	34	34

\* Significant at the 1% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 10% level.

*et al.* (2003, pp. 228, 280) characterize Islam as being negatively associated “with attitudes that are conducive to growth” and, among adherents to the world’s major religions, Muslims as being the most “antimarket,” though these assessments do not appear to be borne out in Tables 1 and 2 relative to the “other religions” excluded category.

There are at least three potential explanations—one intellectual or theological,<sup>16</sup> one sociological,<sup>17</sup> and the aforementioned institutional explanation—that could be used to rationalize the relative economic underperformance of Islamic societies over long periods. Yet as an empirical matter, it is less clear whether Muslim countries have in fact underperformed relative to similarly situated comparators over the past 50 years or so. Indonesia, the world’s largest Muslim country, has grown far more

rapidly than the world average for the past four decades. Even focusing solely on the Middle East, fragmentary data from the 1950s (Barlow, 1982), and more comprehensive data from the 1960s, indicate that, measured either in terms of per capita income growth or TFP growth (Collins & Bosworth, 1996), the performance of this region did not exhibit performance markedly different from other developing countries—better than Sub-Saharan Africa (the other region most profoundly marked by weak states and arbitrary boundaries), worse than East Asia, and comparable to Latin America or South Asia. It could be that the negative interpretations of Islam’s historical legacy are correct but that enough convergence in institutions and behavior has occurred that the effects have dissipated in the contemporary world, or that other positive characteristics in Islamic

societies overwhelm the negative influence of Islam, or it could be that the received wisdom is simply wrong.

This issue is examined more rigorously in Table 3. The first two columns report regressions of the standard model, with the Muslim share and a dummy variable for oil exporters added. The coefficient on the Muslim share variable—relative to all non-Muslims—is positive and significant at the 5% level in the TFP regression 3.1—a one percentage point increase in the share of the population professing Islam is associated with a 0.02–0.03 percentage point increase in TFP growth. The Muslim share is insignificant in the regression on per capita income growth (3.2), consistent with the result obtained in Tables 1 and 2. This result holds even if one uses simultaneous equation estima-

tors to control for any possible negative influence of Islam on human and physical capital accumulation.

Islam, like other religions, is open-ended, subject to interpretation, and widely varying in practice across both the dimensions of time and distance. Much of the argumentation discussed thus far relates to developments in the Middle East, and the category “Muslim” may be too broad to be analytically meaningful (cf. Zubaida, 1995). Not all Muslims are alike; in particular, other cultural influences in non-Arab Muslim societies (such as through the Chinese in Southeast Asia or the French in West Africa) may attenuate the impact of Middle Eastern traditions.

To investigate this possibility, the Muslim population share of each country was weighted

Table 3. *Muslim and Arab variable regressions*

Independent variables	Dependent variables							
	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)	(3.7)	(3.8)
	TFP 1973–84	Growth 1970–90	TFP 1973–84	Growth 1970–90	TFP 1973–84	Growth 1970–90	TFP 1973–84	Growth 1970–90
Initial GDP per capita	-0.00054 (-2.86)*	-0.00034 (-3.88)*	-0.00058 (-3.01)*	-0.00034 (-3.88)*	-0.00057 (-3.01)*	-0.00034 (-3.87)*	-0.00057 (-3.08)*	-0.00033 (-3.80)*
Investment share	0.03981 (1.11)	0.07575 (3.08)*	0.04095 (1.13)	0.07507 (3.04)*	0.03607 (1.01)	0.07223 (2.93)*	0.03959 (1.13)	0.074 (3.00)*
Government share	-0.04349 (-1.00)	-0.02462 (-1.01)	-0.0696 (-1.42)	-0.033 (-1.31)	-0.0755 (-1.59)	-0.03893 (-1.52)	-0.10314 (-2.00)**	-0.04211 (-1.58)
Openness	-0.01059 (-1.03)	-0.00366 (-0.52)	-0.01044 (-1.00)	-0.00314 (-0.44)	-0.01037 (-1.02)	-0.0036 (-0.51)	-0.01122 (-1.11)	-0.00352 (-0.50)
Education	0.85184 (2.98)*	0.59672 (3.82)*	0.85578 (2.92)*	0.57647 (3.73)*	0.81344 (2.95)*	0.56167 (3.71)*	0.81726 (3.02)*	0.54101 (3.58)*
Muslim	0.02224 (2.10)**	0.01285 (1.66)	—	—	—	—	—	—
Muslim/distance	—	—	29.90846 (1.88)***	15.1504 (1.52)	—	—	—	—
Arab	—	—	—	—	0.04239 (2.30)**	0.0241 (1.88)***	—	—
Arab/distance	—	—	—	—	—	—	48.3926 (2.55)**	20.874 (1.74)***
Net oil exporter	0.21009 (0.25)	0.16311 (0.28)	0.38057 (0.45)	0.21911 (0.38)	0.21006 (0.25)	0.07476 (0.13)	0.52602 (0.65)	0.23152 (0.40)
Constant	-1.21004 (-1.22)	0.14685 (0.20)	-0.58206 (-0.59)	0.41315 (0.60)	-0.22503 (-0.23)	0.66794 (0.97)	0.20015 (0.19)	0.73615 (1.05)
$R^2$	0.24	0.30	0.23	0.30	0.26	0.31	0.28	0.31
$F$ (all explanatory vars)	1.95***	4.37*	1.80	4.28*	2.10***	4.52*	2.30**	4.42*
Number of observations	50	78	50	78	50	78	50	78

\* Significant at the 1% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 10% level.

by dividing by the distance between the national capital and Mecca (i.e., the weighted Muslim share declines with distance). In these regressions, the inverse distance weighted Muslim share is positive and significant at the 5% level in the TFP regression (3.3) and insignificant in the per capita income growth regression (3.4).

Along similar lines what is at issue may be characteristics of Arab culture that are misattributed to Islam. Regressions 3.5 and 3.6 report regressions in which the Arab population share is added to the model, and for the sake of completeness, regressions 3.7 and 3.8 report the results with the inverse distance Arab population share. In all four cases, the relevant coefficient is positive and significant at the 10% level or better.

An examination of the residuals revealed that once again Guyana was the only outlier. Among the predominately Muslim countries, studentized residuals exceeding 2.0 in absolute value were relatively rare: only Indonesia in regression 3.8 (2.01) and Iran in regressions 3.1 (-2.67) and 3.3 (-3.15). These results provide no support for the notion that Islam is a drag on growth—if anything, the results in Table 3 reinforce the notion that the impact of Islam is positive.

#### 4. ANALYSIS ON SUBNATIONAL DATA

The cross-national results reported thus far are suggestive but are subject to distortion arising from the inability to adequately control for country-specific economic, political, and institutional influences. Many economic phenomena that vary across countries such as differences in inflation rates, trade policies, or judicial practices can be ignored when examining developments within a single country using data on subnational jurisdictions.

What are needed are countries in which there is a substantial, but not overwhelmingly, Muslim population. (If a country's population is entirely or nearly entirely Muslim there will not be enough cross-jurisdictional variation in the religious identity data to identify its impact statistically.) And, of course, there has to be sufficient subnational data to construct a usable data set. Unfortunately, one or both of these requirements ruled out the countries of the Middle East.<sup>18</sup> Three multiethnic countries in three different parts of the world met these criteria: India, Malaysia, and Ghana.

#### (a) *India*

India has the world's third largest Muslim population, following Indonesia and Pakistan. Table 4 reports regressions of economic and religious affiliation variables on state-level data. In regression 4.1, the dependent variable is TFP growth for 17 "heavily agricultural" states derived from Fan, Hazell, and Thorat (1999).<sup>19</sup> The growth rates of TFP were calculated for 1973–83 and 1983–93 and the observations stacked, with a dummy for the first sample period included to allow the intercept to vary.<sup>20</sup> The regressions were estimated with 1971 (1981) values of the initial level of TFP, female literacy rate, state development expenditures per capita, population density, percentage of villages with electricity, road density, a quadratic function of annual rainfall, and a landlocked state dummy.<sup>21</sup> All except the initial level of TFP, female literacy, and state development expenditures per capita were insignificant. The Indian census data break down religious affiliation by Hindu, Muslim, Christian, Sikh, Buddhist, and Jain shares, with other religions (mostly indigenous animistic religions) broken out for the 1981 sample, but not for the 1971 sample. (No religion/not reported is the omitted share in the regressions.) The results for regression 4.1 show that the hypothesis that the coefficients on the religion variables are jointly equal to zero can be rejected at the 5% level, none of the coefficients on individual religious affiliation variables, including the Muslim share, are statistically significant.

In regression 4.2, real per capita income growth in 1981–96 is regressed against the initial income level, female literacy, and the religion variables.<sup>22</sup> In this case, the coefficients on three of the religious-affiliation variables (Buddhist, Jain, and other) are positive and significant at the 5% level, and the coefficients on the religious affiliation variables are jointly significant at the 1% level. The coefficient on the Muslim share is again insignificant.

#### (b) *Malaysia*

The population of Malaysia consists largely of three ethnic groups: indigenous Malays called bumiputra, Chinese, and Indians, and there is a high correlation between ethnicity and religious affiliation.<sup>23</sup> Islam is the official state religion, though the freedom to practice other religions is guaranteed under the constitution.<sup>24</sup>

Table 4. *Indian regressions*

Independent variables	Dependent variables	
	(4.1) TFP 1973–93	(4.2) Growth 1981–96
Initial TFP level	–0.05999 (–2.00) <sup>***</sup>	–
Initial GDP per capita	–	–0.00582 (–2.02) <sup>***</sup>
Female literacy rate	0.19155 (2.26) <sup>**</sup>	0.08209 (2.17) <sup>**</sup>
Development expenditures per capita	–0.0859 (–3.50) <sup>*</sup>	–
Decade 1973–83 dummy	–2.60826 (–1.73) <sup>***</sup>	–
Hindu share	0.10566 (0.12)	0.03612 (0.82)
Muslim share	0.00471 (0.01)	–0.07112 (–0.95)
Christian share	–0.3539 (–0.40)	0.04189 (0.94)
Sikh share	0.18992 (0.22)	0.05912 (1.15)
Buddhist share	0.67502 (0.66)	0.17479 (2.25) <sup>**</sup>
Jain share	–1.07947 (–1.23)	1.49234 (2.29) <sup>**</sup>
Other religion share	–	0.15009 (2.23) <sup>**</sup>
Constant	1.90728 (0.02)	–0.40808 (–0.09)
$R^2$	0.64	0.65
$F$ (all explanatory vars)	3.41 <sup>*</sup>	3.29 <sup>**</sup>
$F$ (religion vars only)	3.37 <sup>**</sup>	3.68 <sup>*</sup>
Number of observations	30	26

\* Significant at the 1% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 10% level.

Table 5 reports regressions for real per capita income growth in 1990–2000.<sup>25</sup> In regression 5.1, population density and juvenile delinquency, a proxy for the absence of “law and order,” are both statistically significant. The initial income level is not negative and significant (i.e., the Malaysian states do not exhibit convergence). Regression 5.2 reports a regression of ethnicity in 1990 on per capita income growth. None of the coefficients are individually significant, including the coefficient on the bumiputra share, despite the introduction of affirmative action style policies to promote bumiputra economic interests. The ethnicity coefficients are jointly significant at the 5% level. Regression 5.3 combines the economic fun-

damentals with the ethnicity variables, there being only a handful of degrees of freedom, and nothing significant. There is some evidence that the inclusion of Sabah (one of the two states on Borneo in East Malaysia) exerts a significant influence on the results: If Sabah is excluded from the regression, the coefficients on population density and juvenile delinquency in regression 5.1 become insignificant.

Table 6 reports regressions of religious affiliation on growth. Regression 6.1 reports a regression of religious affiliation in 2000 (the first census for which it was reported on the subnational level) on per capita income growth, relative to an omitted category consisting of tribal/folk religions, other religion, no religion,

Table 5. *Malaysian regressions on ethnicity*

Independent variables	Dependent variables		
	(5.1) Growth 1990–2000	(5.2) Growth 1990–2000	(5.3) Growth 1990–2000
Initial GDP per capita <sup>a</sup>	0.04404 (0.04)	–	–0.00595 (–0.01)
School enrollment <sup>a</sup>	3.39833 (0.47)	–	–2.60131 (–0.4)
Juvenile delinquency <sup>a</sup>	–2.89451 (–2.16) <sup>***</sup>	–	–1.34833 (–1.02)
Population density <sup>a</sup>	1.1193 (3.78) <sup>*</sup>	–	0.32594 (1.03)
Bumiputra	–	–0.22305 (–0.71)	–0.24833 (–0.39)
Chinese	–	–0.1741 (–0.56)	–0.2121 (–0.33)
Indians	–	–0.20342 (–0.66)	–0.18287 (–0.31)
Constant	–29.00088 (–0.86)	23.72559 (0.77)	30.61908 (0.39)
$R^2$	0.62	0.61	0.72
$F$ (all explanatory vars)	3.64 <sup>**</sup>	4.63 <sup>**</sup>	1.83
$F$ (ethnicity vars only)	–	–	1.66
Number of observations	14	13	13

<sup>a</sup> Variable specified in natural logs.

<sup>\*</sup> Significant at the 1% level.

<sup>\*\*</sup> Significant at the 5% level.

<sup>\*\*\*</sup> Significant at the 10% level.

and unknown religion. The coefficients on the Muslim, Christian, Hindu, and Buddhist shares are negative and statistically significant relative to this excluded category. Regression 6.2 combines the economic fundamentals with the religious affiliation variables. The coefficients on the Muslim and Buddhist shares are again significant, though the interpretation of the religious affiliation results is problematic—logically the pattern of religious affiliation in 2000 cannot cause differences in cross-state growth performance starting at an earlier date (i.e., the right-hand-side variables violate exogeneity).

In light of the high correlation between religion and ethnicity, the ethnicity data were used to construct instruments for religion by regressing the ethnicity shares in 2000 on religious affiliation in 2000 and then using the estimated regression coefficients and the ethnicity data from 1990 to construct fitted values for the missing 1990 religion data. These instrumental variable regressions are reported in Table 6 as regressions 6.3 and 6.4. None of the variables is statistically significant.

### (c) *Ghana*

Like India and Malaysia, Ghana is a multi-ethnic, multireligious country with a significant Muslim population. Both Islam and Christianity have made considerable inroads over the last century, with the share of the population to traditional animistic religions falling from approximately 90% of the population in 1900 to around 20% today. Anthropological studies summarized in Last (1979) and Kennedy (1988) indicate that conversion to the Abrahamic faiths has sometimes been associated with behavioral changes such as greater entrepreneurship and the establishment of modern business enterprises.

Data on per capita income levels for Ghana's 10 regions were constructed from household surveys conducted in 1988, 1992, and 1998.<sup>26</sup> In addition to income, these surveys were used to construct data at the regional level on such attributes as years of schooling, ethnicity, religious affiliation, population density, time spent fetching water and wood, and distance to water source. Monthly data on average and extreme

Table 6. *Malaysian regressions on religion*

Independent variables	Dependent variables			
	(6.1)	(6.2)	(6.3)	(6.4)
	Growth 1990–2000	Growth 1990–2000	(IV Estimation) Growth 1990–2000	(IV Estimation) Growth 1990–2000
Initial GDP per capita <sup>a</sup>	–	0.09901 (0.12)	–	0.02382 (0.03)
School enrollment <sup>a</sup>	–	0.92202 (0.14)	–	2.24213 (0.23)
Juvenile delinquency <sup>a</sup>	–	–2.68143 (–1.55)	–	0.3039 (0.15)
Population density <sup>a</sup>	–	1.06262 (1.66)	–	0.02385 (0.06)
Islam	–0.42962 (–3.02)**	–0.37528 (–2.25)***	–23.03501 (–1.6)	–22.88037 (–0.52)
Christianity	–0.57565 (3.37)*	–0.4399 (–2.09)	–0.42122 (–2.61)**	–0.48531 (–1.29)
Hinduism	–0.46729 (–2.83)**	–0.24363 (–1.05)	38.69487 (1.56)	38.2994 (0.51)
Buddhism	–0.34319 (–2.30)***	–0.4243 (–2.25)***	–63.8342 (–1.57)	–63.39241 (–0.51)
Confucianism	–0.34973 (–1.57)	–0.19037 (–0.73)	83.12802 (1.53)	82.74259 (0.5)
Constant	44.30398 (3.12)**	19.21894 (0.54)	2222.91966 (1.6)	2199.73974 (0.52)
R <sup>2</sup>	0.85	0.91	0.84	0.85
F (all explanatory vars)	8.78*	4.63***	7.49*	1.89
F (religion vars only)	8.78*	2.69	7.49*	1.65
Number of observations	14	14	13	13

<sup>a</sup> Variable specified in natural logs.

\* Significant at the 1% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 10% level.

temperatures and precipitation are also available at the regional level through the Ghana Meteorological Services Department. Given environmental differences between coastal southern Ghana and the northern Savannah, data on regional capital latitude were collected, and a landlocked regional dummy was constructed.

Calculation of simple correlation coefficients revealed statistically significant positive correlations between regional growth and years of schooling (with female years of schooling slightly more highly correlated with growth than male schooling); latitude; regional variance in rainfall; the Protestant population share; and the population shares of two ethnic groups, the Hausa and the Akan. (The Hausa are almost exclusively Muslim while the Akan are predominately Christian.) Growth was negatively correlated with the animist population

share and a catch-all “other” ethnic classification. Regional growth was not statistically significantly correlated with the initial level of per capita income. The infrastructural development indicators (time spent fetching water and wood and distance to water) were highly correlated with the regional level of per capita income but not with regional growth.

These simple correlations are largely borne out by the regressions stacked panel data reported in Table 7. Regression 7.1 reports a regression of initial per capita income, average female years of schooling, population density, latitude, and religious affiliation on regional per capita income growth. (The infrastructural and meteorological variables were never statistically significant in the regressions and these results are not reported.) Regional income converges, conditional on female schooling, regional population density, and latitude. The

Table 7. *Ghanaian regressions*

Independent variables	Dependent variables	
	(7.1)	(7.2)
Initial GDP per capita	-0.00006 (-9.86)*	-0.00008 (-7.37)*
Period	-2.27348 (-1.89)**	-3.30132 (-2.11)***
Female years of education	5.05496 (4.06)*	7.6208 (3.92)*
Latitude	-2.18203 (-2.92)**	-1.68668 (-1.12)
Population density	0.03367 (3.00)**	0.06631 (3.34)**
Christians	-0.08378 (-0.85)	
Muslim	0.17148 (2.75)**	-
Akan		-0.07675 (-0.83)
Ewe		-0.14017 (-1.62)
Ga/Adangbe		-0.25937 (-1.44)
Dagbani		0.23201 (2.74)**
Hausa		-0.95475 (-1.30)
Nzema		0.07377 (0.18)
Constant	31.4018 (3.43)*	31.53156 (1.96)***
$R^2$	0.94	0.95
$F$	8.28*	2.21
	(religion)	(ethnicity)
Number of observations	20	20

\* Significant at the 1% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 10% level.

coefficient on the Muslim share is positive and significant at the 5% level.<sup>27</sup> (The animist share is the omitted category.) The coefficients on Christian population shares are insignificant, regardless of whether the Christians are distinguished by denomination (not reported) or grouped together (8.1).

The population shares of two ethnic groups (one almost entirely Muslim, the other mainly Christian) were positively correlated with regional income growth. The regression is re-estimated in 7.2, with ethnicity replacing religious affiliation. (The "other" ethnicity is the omitted category.) Neither the coefficient on the Hausa nor Akan share is statistically significant, though the coefficient for the Dagbanis, an eth-

nic group without any particular reputation for commercial acumen, is. The F-test on the joint significance of the ethnic affiliation coefficients cannot reject the hypothesis of no influence.

Finally, it has been suggested that the power of the statistical tests could be increased by pooling the three countries' data. This attractive proposition immediately encounters practical problems in implementation: The data for the three countries are not available for a common sample period, and the definitions of some of the regressors (those representing human capital, for example) differ across the three data sources, and as a consequence are omitted. Nevertheless, pooled regressions on subnational income growth for India (1991-96),

Table 8. *Pooled subnational regressions*

	(8.1) <sup>a</sup>	(8.2) <sup>b</sup>
	Growth	Growth
Malaysia	-5.46953 (-1.18)	-7.48716 (-1.69)
Ghana	-6.41065 (-2.30)**	-6.25521 (-2.12)**
Initial GDP per capita	-0.00015 (-0.16)	-0.00018 (-0.24)
Population density	0.00026 (0.64)	0.00023 (0.55)
Latitude	0.03179 (0.26)	-0.01766 (-0.14)
Landlocked	-3.47781 (-2.66)**	-2.59358 (-2.00)**
Muslim	0.02773 (0.49)	0.08113 (1.62)
Christian	0.05599 (1.41)	0.08954 (2.52)**
Hindu	-0.03484 (-0.82)	-0.00191 (-0.05)
Buddhist	0.09075 (1.02)	0.15473 (1.83)**
Confucian	0.32130 (0.76)	0.35930 (0.99)
Jain	1.79550 (1.28)	1.85679 (1.16)
Sikh	0.02858 (0.49)	0.06385 (1.04)
Constant	3.86635 (0.81)	1.04548 (0.22)
$R^2$	0.55	0.59
$F$ (all explanatory vars)	2.84*	3.01*
$F$ (religion vars only)	2.85**	2.97**
Number of observations	50	50

<sup>a</sup> OLS regression.

<sup>b</sup> Weighted least-squares regression.

\* Significant at the 1% level.

\*\* Significant at the 5% level.

Malaysia (1990–2000), and Ghana (1988–98) are reported in Table 8. The regressions have been estimated using OLS and weighted least squares, and the latter takes into account the differing lengths of sample periods across the three countries. These results do not provide any support for the notion that Islam has a significant impact on growth.

## 5. CONCLUSIONS

This paper has investigated the relationship between religion and economic performance.

In both cross-country and within-country regressions, the null hypothesis that religious affiliation is uncorrelated with performance can frequently be rejected, though the regressions do not yield a robust pattern of coefficients with respect to particular religions.

Some commentators have claimed that Islam is inimical to growth. In general, this is not borne out by the econometric analysis either at the cross-country or within-country level. Predominately Muslim countries are seldom outliers (either positively or negatively) in the cross-country regressions. In most cases, the coefficient on the Muslim population share is

statistically insignificant. With one exception, where it is significant, it is always positive. The only case of a statistically significant negative coefficient is in a subnational regression for Malaysia.

That said, one cannot prove the non-existence of the posited effect. Islam, like all religions, changes over time and space. It is possible that one could obtain differing results from another

time period, a different country sample, or in analysis of subnational jurisdictions, by examining data from countries in the Middle East (if such data were available). What one can say from this paper is that on the basis of three types of evidence, contemporary Islam, as practiced in the countries in this sample, does not appear to be a drag on growth.

## NOTES

1. Following Iannaccone (1998), the term religion is used to mean any shared set of beliefs, activities, and institutions premised upon faith in supernatural forces.
2. See Samuelsson (1961), Iannaccone (1998), and sources cited therein for critical commentaries.
3. Greif (1994) argues that Roman Catholic theology supported fundamental economic and social innovations in Europe centuries before the Reformation, advantaging the merchants of Genoa relative to their Maghribi competitors. Kuran provides an interpretation of how Islamic practices, for example, inheritance rules, inhibited the development of commercial institutions comparable to those developed in the West during the Renaissance, and as a consequence disadvantaged Islamic merchants in competition with their Western counterparts. Indeed, he argues that these institutional constraints explain why non-Muslim religious minorities increasingly dominated commerce within the Middle East until the widespread adoption of Western institutions and practices in the 19th century (Kuran, 2004a). Lal (1998) reaches the same conclusion as Greif through a different route, emphasizing changes in family law under Pope Gregory I and the establishment of modern legal institutions under Pope Gregory VII.
4. Modernization theorists regarded economic development as one facet of a systematic process of modernization that among other things would result in a diminution of religious institutions, practices, and consciousness per the so-called secularization thesis (cf. Berger, 1967; Martin, 1978), which, ironically, its most prominent proponents would later repudiate (cf. Berger, 1999; Martin, 1999). Gellner (1992) argues that the secularization thesis is essentially correct with respect to the world's major religious traditions—with the sole exception of Islam, which, he argues is “the one closest to modernity” (Gellner, 1981, p. 7).
5. Stulz and Williamson (2003) obtain the not entirely elucidated result that stock-market development depends on legal tradition (common law or civil law), while debt market and banking development depend on culture proxies (i.e., dominant religion), with creditor rights and enforcement greater in Protestant-dominant societies.
6. Kumar and Russell (2002, Table 1) suggest that typically countries may be well inside their estimated production possibility frontiers.
7. These include life expectancy, urbanization, and macroeconomic variables including measures of inflation and financial development that are highly correlated with the included regressors. Political-institutional variables that were tried included Freedom House and Polity IV project variables. These measures tended to be either statistically insignificant or not available for a substantial sample share (as was the case with the Acemoglu, Johnson, and Robinson (2001) settler death rate instrument for institutional quality), though as Barro (1999) has shown, there may be a nonlinear relationship between religious affiliation and political development, and *inter alia*, economic performance. Geographic and endowment variables tried included an oil exporter dummy, a dummy for land-locked countries, and national capital latitude and temperature. Again, these did not yield robust results once the core explanatory variables reported in Table 1 were included. The one variable that was consistently significant was expropriation risk, but unfortunately, the measure is only available for relatively recent sample periods and hence raises basic issues of causality and violating exogeneity.
8. Some Islamic governments have impeded female education. Lindert (2003) found that the presence of a “dominant Catholic Church” discouraged primary school education enrollment rates in a sample of 24 countries in 1881–1937.
9. A number of cultural and religiosity variables derived from the World Values Survey were then added one at a time to regressions 1.1 and 1.2. In no case were the cultural or religiosity variables statistically significant, and in the interest of brevity, these regressions are

not reported. These results are consistent with those obtained by Sala-i-Martin *et al.* (2004) and differ from those obtained by Barro and McCleary (2003).

10. Unfortunately, the original source does not differentiate Muslims by sect, and attempts to find consistent cross-national data in this regard have been unsuccessful.

11. Another issue is whether it is religious affiliation or the existence of a “dominant” religion (Lindert, 2003), the degree of religious fragmentation, or state-supported religion (Barro & McCleary, 2003) that is relevant. The issue of state support is particularly problematic, as some countries that formally maintain a state religion appear to be fairly ecumenical in practice (e.g., Malaysia), while others appear to have in effect a state religion, though it is not officially sanctioned.

12. One possible other source of difference is that both Barro and McCleary (2003) and Sala-i-Martin, Doppelhofer, and Miller use the first edition of the *World Christian Encyclopedia* as their source of religious affiliation data; the data used in this paper are taken from the second edition.

13. Maddison reports income data for more than 34 countries, but for some countries such as Egypt, the complementary data on the explanatory variables used below are not available.

14. See Said (1978) and Kuran (2004) for a discussion. The basic argument is that Islam preaches fatalism which is inimical to growth; of course, the Koran, like other religious texts is open-ended and subject to interpretation, and as Rodinson (1973) and Kuran (2004) point out there are also verses that encourage enrichment. Of course there is also literature that lays the blame at the feet of Western imperialism (cf. Rodinson, 1973; Wallerstein, 1997).

15. See Siddiqi (1981) and Kuran (1992) for surveys of Islamic economic institutions and thought. Rodinson (1973) and Kuran (2003b, 2004) argue that in reality, uniquely Islamic economic practices and institutions have minimal impact on resource allocation. See also Khan and Mirakor (1987).

16. Lewis (1982) argues that Islam itself changed—somewhere during the 9th and 11th centuries, “the gate of *ijtihad*” (independent reasoning) was closed—meaning that all answers were already available; hence, there was no need for inquiry. Lewis (1993) expands upon this critique of “the authoritarian character of traditional pedagogy” and its emphasis on rote memorization. Ayubi (1993) accepts Lewis’ interpretation of the closing

of the gate of *ijtihad* but argues that it was reopened in the 19th century by the emergence of Jamal al-Din al-Afghani and his disciples. Hallaq (1984, 1997) dismisses the whole proposition as “entirely baseless and inaccurate” (1984, p. 4).

17. Weber, following the writings of 14th century Islamic writer Ibn Khaldun, argued that a warrior ethic that emphasized pillage as a means of acquisition was incompatible with the “spirit of capitalism.” Neither the warrior tradition with its plunder ethic nor the sedentarized dynastic bureaucracy could provide the cultural rationale for development through intensive means.

18. Of the major countries of the Middle East, Egypt has the largest non-Muslim minority, but unfortunately, there is insufficient data at the governate level to carry out the analysis.

19. The TFP data are available for Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Jammu and Kashmir, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Data on explanatory variables are missing for Jammu and Kashmir and Assam, yielding 15 usable cross-sectional observations and a panel of 30 observations.

20. A number of sample observations were lost due to missing data for some of the variables.

21. The female literacy rate fit the data better than did the male literacy rate or the overall literacy rate. Since according to Schultz (1995) there are reasons to believe that female literacy has an especially positive impact on development, the regressions with female literacy are reported.

22. The Indian census reports data for 30 states. In regression 4.2, per capita income growth is missing for Lakshadweep, Dadra, and Nagar Haveli. Religious affiliation data are missing for Assam.

23. The simple correlation between Islam, Hinduism, Buddhism, and Confucianism/Taoism population shares and the shares of each of the three ethnic groups is significant at the 10% level or better in all cases. The lack of correlation between Christianity and ethnicity is exceptional in this regard.

24. See Jomo (1992) on the possible relationship between Islam and economic development in Malaysia.

25. The number of observations varies across the regressions due to some missing data—data on ethnicity,

juvenile delinquency, and population density are unavailable for the Labuan federal territory; ethnicity data are not available for Sabah.

26. A survey for 1987 also exists and contains such peculiarities in the responses as to render the data extremely suspect.

27. As in the cross-national case, this result is obtained even if simultaneous equation estimators are used to control for any possible negative impact of Islam on female educational attainment.

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## APPENDIX A

The cross-country data on religion have been taken from Barrett, Kurian, and Johnson (2001). Per capita income, government share of GDP, investment share of GDP, and openness data came from the Penn World Tables Mark 6.1. Per capita income growth, government share of GDP, and investment share of GDP are in current international dollars. Initial per capita income is in constant prices (chain series). Education data have been obtained from the Barro-Lee "International Measures of Schooling Years and Schooling Quality" data set available on the World Bank's website. As noted in the text, the cross-country TFP estimates were originally constructed by Collins and Bosworth (1996) but are actually published in Rodrik (1999).

Urbanization data were obtained from "World Urbanization Prospects: The 2001 Revision" (United Nations, 2002). Temperature and latitude data were taken from [www.worldclimate.com](http://www.worldclimate.com) and, in some cases for the latter, were estimated by visual inspection of a map. Nobel Prize data were calculated from <http://www.nobel.se>. Data on political institutions were found in the Polity IV Project dataset (Polity IV Project, 2000).

Distance to Mecca was calculated from each country's capital using latitudes and longitudes. The Arab share of population is calculated from data in Barrett *et al.* (2001).

Long-run cross-country data on per capita GDP were taken from Maddison (2003). Population and religion data for 1900 were taken from Barrett *et al.* (2001). Urbanization data for 1900 were calculated from Chandler and Fox (1974).

Indian data on per capita GDP, population density, female literacy rates, and religion were taken from the *Statistical Abstract of India* (various years). Data on state TFP levels, village electrification, road density, and development expenditures were obtained from "Government Spending, Growth, and Poverty," Fan *et al.*

(1999). The authors also kindly provided the data on annual rainfall.

Malaysian data on state per capita GDP, population density, and religion and ethnicity for 2000 were acquired from the "Population Distribution and Basic Demographic Characteristics" produced by the Department of Statistics, Malaysia. Other data concerning per capita GDP, school enrollment, juvenile delinquents, population density, and ethnicity were

taken from the "General Report on the Population Census" (various years), also produced by the Department of Statistics, Malaysia.

As described in the text, the data for Ghana are derived from the Ghana Living Standards Surveys, with the exception of the meteorological data that were obtained from the Ghana Meteorological Services Department.

See Table 9.

Table 9. *Countries in the regression samples*

Algeria <sup>b</sup>	Finland	Republic of Korea	Spain <sup>c</sup>
Argentina <sup>a</sup>	France <sup>c</sup>	Malawi <sup>b</sup>	Sri Lanka <sup>b</sup>
Australia <sup>c</sup>	Germany <sup>c</sup>	Malaysia <sup>b</sup>	Sweden <sup>c</sup>
Austria <sup>c</sup>	Ghana <sup>b</sup>	Mauritius <sup>b</sup>	Switzerland <sup>c</sup>
Bangladesh <sup>b</sup>	Greece <sup>c</sup>	Mexico <sup>a</sup>	Syria
Belgium <sup>c</sup>	Guatemala <sup>b</sup>	Morocco	Taiwan <sup>b</sup>
Benin	Guyana <sup>b</sup>	Mozambique <sup>b</sup>	Thailand <sup>a</sup>
Bolivia <sup>b</sup>	Haiti <sup>b</sup>	Netherlands <sup>c</sup>	Togo
Brazil <sup>a</sup>	Honduras <sup>b</sup>	New Zealand <sup>c</sup>	Trinidad <sup>b</sup>
Cameroon <sup>b</sup>	Hungary	Nicaragua <sup>b</sup>	Tunisia <sup>b</sup>
Canada <sup>c</sup>	Iceland	Norway <sup>c</sup>	Turkey <sup>c</sup>
Central African Republic	India <sup>b</sup>	Pakistan <sup>b</sup>	Uganda <sup>b</sup>
Chile <sup>a</sup>	Indonesia <sup>a</sup>	Panama <sup>b</sup>	United Kingdom <sup>c</sup>
China <sup>a</sup>	Iran <sup>b</sup>	Paraguay <sup>b</sup>	United States <sup>c</sup>
Colombia <sup>a</sup>	Ireland	Peru <sup>a</sup>	Uruguay <sup>a</sup>
Costa Rica <sup>b</sup>	Israel <sup>b</sup>	Philippines <sup>b</sup>	Venezuela <sup>a</sup>
Cyprus <sup>b</sup>	Italy <sup>c</sup>	Portugal <sup>c</sup>	Zambia <sup>b</sup>
Denmark <sup>c</sup>	Jamaica <sup>b</sup>	Rwanda <sup>b</sup>	
Dominican Republic <sup>b</sup>	Japan <sup>c</sup>	Senegal <sup>b</sup>	
Ecuador <sup>b</sup>	Jordan <sup>b</sup>	Singapore <sup>b</sup>	
El Salvador <sup>b</sup>	Kenya <sup>b</sup>	South Africa <sup>a</sup>	

*Note:* All countries are in the 78-country sample except Hungary and Morocco (in the 34-country sample only).

<sup>a</sup> The country is also in the 50- and 34-country samples.

<sup>b</sup> The country is also in the 50-country sample.

<sup>c</sup> The country is also in the 34-country sample.

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