Is Personal Insecurity a Cause of Cross-National Differences in the Intensity of Religious Belief?

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Abstract

Previous research has shown an apparent relationship between "societal health" and religiosity, with nations that exhibit higher mean personal religiosity also tending to provide worse social environments. A possible cause is that exposure to stressful situations (i.e. personal insecurity) increases personal religiosity. To test this hypothesis, income inequality, a widely available proxy for personal insecurity, was compared with other macro-scale causes of religiosity (derived from modernization and rational choice theories) in a multinational, cross-sectional analysis. Income inequality, and hence personal insecurity, was found to be an important determinant of religiosity in this diverse sample of nations.

Introduction

[1] The cause of cross-national differences in individual-level religiosity has a rich history of scholarly debate rooted in observations of an apparent decline in religiosity in the modern era. Numerous causal factors have been proposed. A prominent strand of thought, originally formulated by Weber, supposes that greater education, along with the free and open transmission and discussion of ideas, undermines superstitious or non-naturalistic thinking. Empirical support for this includes the observation that national-level religiosity and scientific productivity are inversely correlated (Jaffe). Another strand, rooted in the work of Durkheim, suggests that the displacement of religious social institutions by secular ones leads to the gradual loss of importance of religious ideas. Complicating the debate are the multitudinous definitions of the term "secularization," which has come to refer variously to a decline in religious participation or a decline in individual piety.

[2] Secularization theory has been criticized on several grounds, not least that the assumed trend to ever decreasing religiosity did not appear to have been borne out in the second half of the twentieth century. Furthermore, substantial variation in religiosity exists across nations

with similar levels of economic development. Most notably, the U.S. has been put forward as an example of a prosperous nation that has retained high levels of religiosity. Partly in response to these observations, an alternative to secularization theory has been developed that stems from concepts of free market economics. A central assumption of Rational Choice Theory (RCT) is that demand for religious products remains constant. This assumption is supported by recent developments in the study of the biological evolution of religious behavior, which suggest that humans have evolved a genetic predisposition to religious belief (Rossano). In simple terms, secularization in RCT occurs not as a consequence of modernization, but due to competition for attention from secular services and provision of unattractive products by the monopoly of religious providers, which results in a decreased use of religious "goods." Recent formulations of secularization theory have tended to emphasize institutional secularization, whereby a differentiation between secular and religious institutions leads to the privatization of religion (Pettersson). According to this paradigm, functions that were historically provided by religious institutions, such as education, health care, and social welfare, have increasing become the remit of the state or other secular institutions. As a consequence, participation in religious activities brings reduced benefit to the individual, membership of religious institutions declines, and religion becomes increasingly a matter for private belief. The resulting social shift has been characterized as "believing without belonging" (Davie).

[3] As Pettersson has noted, since pluralism and religious openness (prime drivers of religiosity under RCT) are hallmarks of late modern culture, one would expect secularization and RCT to act in opposition. However, the two are not always in conflict. For example, a proposition of RCT is that modernization can increase the value of non-religious activities to the individual, thus increasing the opportunity cost of time devoted to religion (McLeary and Barrow). In particular, urbanization can lead to reduced religious attendance because of increased competition from secular leisure activities.

[4] However, recent data from the European Values Survey have served to undermine the notion of constant demand for religious services, and especially the notion that secularization in Europe can be characterized as "believing without belonging." Indeed, several advanced nations (Sweden and Britain, for example) are better characterized by the phrase "belonging without believing" (Halman and Draulans). Likewise Voas has shown that, in the U.K., the decline in religious participation is largely linked to a decline in belief. These differences among societies in the demand for religious goods, or personal religiosity, require explanation. It should be noted that "belief" is an umbrella term that refers to a number of different (but related) worldviews that may vary between nations and over time (e.g., cosmic dualism vs. a benevolent God). This further complicates attempts to understand the changing landscape of belief.

Existing Evidence Linking Personal Insecurity to Religiosity

[5] Rational choice theory is not the only potential explanation of differential religiosity among nations of similar wealth. Recently, Norris and Ingelhart have emphasized the importance of increased personal security as a key driver of secularization. They note that modernization does not axiomatically lead to a reduction in social causes of insecurity for all individuals, and that while individuals in high income nations are typically shielded from

some, other social causes of insecurity remain. Among these are factors such as fear of crime or unjust treatment, fear of illness or premature mortality, and financial insecurity.

[6] Thus, they hypothesize that the differences in religiosity among high income nations is partly due to differences in personal security. Among other observations, Norris and Ingelhart note a strong correlation in a multinational panel between income inequality and religiosity. They argue that high levels of income inequality could increase religiosity. Since the distribution of wealth can vary widely between nations of similar average wealth, this factor may help to explain cross-national differences in religiosity that remain after accounting for material advancement.

[7] The relationship between income inequality religiosity could be direct (due to the stress associated with financial insecurity) or indirect (due to the statistical association between income inequality and a number of other factors that may contribute to personal insecurity). For example, there is a strong univariate correlation between income inequality and life expectancy, although the details of the relationship are complex. Lindström and Lindström have found that the link between income inequality and infant mortality rate is particularly strong among wealthy countries. De Vogli et al. confirm the cross-national link between inequality and life expectancy at birth, and show that within Italy (a nation with moderate income inequality and average life expectancy compared with other wealthy nations), income inequality is a more powerful predictor of life expectancy than mean income or education.

[8] Most recently, Leigh and Jencks confirmed the correlation between income inequality and both infant mortality and life expectancy in a multinational panel composed of high income nations in Europe, North America, and Australasia. However, they find that the relationship is likely due to shared variance with other factors, such as external events or fundamental national differences that simultaneously raise inequality and mortality. In other words, they find that connection is statistically real, but not causal. Similar sentiments were expressed recently by Wilkinson, who pointed out that "instead of suggesting that income inequality is a new risk factor for health, it may be telling us more about the already widely recognized health effects of socioeconomic status and class" (1775).

[9] There may also be a link to sexual health. Among U.S. states, there is a modest correlation between income inequality and the rate of new cases of chlamydia or AIDS infection, although not with gonorrhea or syphilis rates (Holtgrave and Crosby). Among wealthy nations, adolescent pregnancy rates are associated with income inequality and show a similar relationship to violent crime, suggesting that institutional anomie is the common link (Pickett, Mookherjee, and Wilkinson).

[10] Statistical association between inequality and criminality is also well studied, although a causal connection is disputed. In a cross-national study, Fajnzylber, Lederman, and Loayza found a longitudinal, positive association between crime rates (especially homicide) and income inequality that was robust when they controlled for other crime-associated factors. Jensen and Akers demonstrate that decommodification (i.e. welfare payments) does not lead to a reduction in homicide in a large multinational sample – although they do confirm a correlation with income inequality after controlling for welfare.

[11] There is also a positive association between income inequality and corruption. Jon-Sung and Khagram argue that inequality fosters a norm of corruption as acceptable behavior, and they provide evidence from a large multinational database to support this. Bloomquist has found that the recent trend of widening income inequality in the U.S. has paralleled a rise in tax evasion. He argues that this may be because, with widening inequality, the probability of detection is lowered and compliance opportunity costs are increased.

[12] Other societal indicators of personal insecurity that have been linked to income inequality include mental health. Pickett, Oliver, and Wilkinson have found a strong correlation in eight wealthy nations between income inequality and the prevalence of mental illness, including serious mental illness. And regional income inequality has been found to be associated with the prevalence of mental illness in the U.K. (Weich et al.), although not in the U.S. (Sturm and Gresenz). Intergenerational income mobility is also low in those nations with high income inequality, suggesting that in nations with high inequality the prospects for advancement may be blunted (d'Addio). Income inequality can also have an environmental impact. Mikkelson et al. have shown that the number of species in a country that are threatened or declining is highest in those countries with highest income inequality, even after controlling for biophysical conditions, human population size, and per capita GDP or income.

[13] The causality of these relationships are frequently disputed, chiefly on the grounds that controlling for other factors can weaken or even eliminate the correlation. Nevertheless, it holds that income inequality, when measured on a national scale, acts as a proxy for many markers of personal insecurity (the causality of the relationship notwithstanding). Thus, there are good reasons to suppose that income inequality is a strong societal-level proxy for the degree of personal insecurity experienced by individuals within that society.

Explaining Cross-National Differences in Religiosity

[14] The purported link between personal insecurity and religiosity is of direct relevance to previous observations of a link between societal health and religion. Among high-income nations, an apparent statistical link between national-level indicators related to personal insecurity (such as suicide and homicide rate, life expectancy and infant mortality, sexually transmitted disease incidence, abortion and teenage pregnancies) and national mean indicators of individual religiosity (such as average self-reported belief in God and attendance at religious services) has previously been reported (Paul). This attribution has been criticized on both theoretical and statistical grounds (Moreno-Riaño et al.). Nonetheless, the study has attracted a great deal of attention within academic and non-academic circles because the results run counter to what has frequently been observed at the sub-national and individual level (that those individuals within a community with high expressed religiosity may exhibit more pro-social behavior).

[15] This apparently paradoxical result warrants further investigation. If personal insecurity does increase average personal religiosity, then this may help to explain both Paul's findings regarding "societal health" as well as the variation in religiosity among nations of similar economic development. To investigate this hypothesis it is necessary to compare, across a range of countries, the importance of personal security with other factors from

secularization theory and RCT that are also believed to contribute to religiosity. With a sufficiently large database it is possible to undertake this on a rigorous, statistical basis.

[16] The sole previous study to investigate the causes of religiosity at a national level was undertaken by McCleary and Barro, but they did not include income inequality or other measures of personal security as an explanatory variable, and they were only able to include a restricted subset of countries (around 30) in their multivariate analyses. They also did not have available the latest wave of the World Values Survey, which covers a larger number of countries, or to new indices of governmental and social regulation of religion recently developed by Grim and Finke. The present study was undertaken to investigate further the importance of personal insecurity (using income inequality as a proxy) compared with other causes of religiosity in determining the national differences.

[17] In the first part of the analysis, the correlation between religiosity (operationalized as the mean frequency of prayer, see Appendix A) and national or multi-national level indicators of personal security will be compared with the correlation between income inequality and the same indicators. This is done to establish whether income inequality can be used as a proxy for personal security in further analyses. The relationship of frequency of prayer and passionate dualism to personal insecurity is briefly investigated. Finally, the relative importance of personal insecurity (using income inequality as a proxy) as a determinant of religiosity will be assessed by developing a model that incorporates other national-scale determinants of religiosity expected from secularization theories.

Is Income Inequality a Proxy for the Effects of Personal Insecurity on Religiosity?

[18] The establishment of income inequality as a reliable surrogate for personal insecurity as it relates to religiosity would be of interest for both theoretical and practical reasons. Crucially, from a practical perspective, income inequality statistics (admittedly of varying quality) are available for many nations, and so could be used in wide cross-national comparisons as a unitary, integrated measure of personal insecurity. Published research, discussed earlier, reveals that income inequality and a range of indicators of personal insecurity are indeed correlated, especially at the univariate level. If income inequality has a relationship to religiosity that reflects the relationship of personal insecurity to religiosity, then it would be expected that the correlation of income inequality and indicators of societal health would mirror the correlation of religion with that indicator. More simply, if income Gini is a proxy for aggregate personal insecurity, then the measures of personal insecurity that correlate with Gini should also correlate with religion.

[19] To test this hypothesis, a variety of indicators of personal security were identified for which international data exist at either the national or regional level. Broadly speaking, these indicators comprise mean measures of individual-level health and criminality. More details on these datasets are provided in Appendix B. Suicide, arguably an indicator of "societal health," was not assessed. An important factor in cross-national differences in suicide rate is the degree of social integration (Fernquist and Cutright). Thus, personal insecurity is likely a cause of suicide as well as religiosity. The negative relationship between religiosity and suicide (demonstrated by Jensen, among others) may indicate that religiosity is a psychologically protective response to personal insecurity.

[20] The bivariate correlations of these indicators of personal insecurity with mean income inequality for the period 1971-1996 are shown in Table 1. Life expectancy, infant mortality, homicide rates, levels of corruption, prevalence of AIDS, the incidence of abortion, and the country's peace index all correlate with the level of religiosity as measured by the frequency of prayer. These results support and extend the earlier findings of Paul by using a larger, more globally representative dataset, additional markers of personal insecurity, and by employing a simple test of statistical significance.

Table 1. Bivariate correlation (r) of indicators of personal insecurity with income inequality and prayer frequency (negative values indicate an inverse relationship)

	n	Income Inequality (Mean 1975-1995)	Prayer Frequency (Most Recent Data)
Life Expectancy	57	-0.59***	-0.67***
Infant Mortality	56	0.58***	0.70***
Control of Corruption	41	-0.62***	-0.67***
Perception of Corruption	36	-0.55***	-0.72***
Homicide	42	0.41**	0.43**
HIV Prevalence†	55	0.62***	0.36**
Abortion Rate	15‡	0.46*	0.63*
Peace Index	55	-0.54***	-0.49***
Prevalence of Curable STDs	9‡	0.11	0.09
Child Well Being	21	0.06	-0.33
Non-Vehicle Property Crime	18	0.09	0.06

* P<0.01; ** P<0.01; ***P<0.001; † Correlation driven by 4 outliers (all African nations) with high inequality, frequency of prayer, and AIDS prevalence; ‡ Regions, not countries

[21] The strong inverse relationship of religiosity to life expectancy is of particular interest given the widely-recognized fact that, in cross-sectional analyses, older people tend to be more religious. This analysis shows that, despite this, countries with more old people tend to be less religious. Hence, the increase in personal security associated with long life expectancy outweighs the effect of increased religiosity with age. The correlation between the prevalence of HIV infection and both income inequality and religiosity is driven by four African nations with high levels of both. In nations with low HIV prevalence, the relationship is absent.

[22] Neither religiosity nor income inequality correlate with three of the indicators, namely the prevalence of curable sexually transmitted diseases, child well being, and non-vehicle property crime. All of these datasets are relatively small, which raises the bar for discovery of a statistically significant effect. However, with the exception of the negative relationship of child well being to religiosity, the correlations are rather low, which suggests that these factors are truly unrelated either to religiosity or income inequality. Data for both child well being and non-vehicle property crime are for wealthy nations only, which may also reduce the range and hence ability to detect an effect. Notably, there is no evidence for an inverse relationship between religiosity and personal insecurity: where a correlation exists, it is always in the direction of increasing personal insecurity linked to increasing intensity of personal religiosity.

[23] Importantly, all the markers of personal insecurity that correlate significantly with frequency of prayer also correlate with income inequality. Although in this analysis there is a clear and significant relationship between income inequality and several indicators of personal insecurity, it should be noted that the causality of these relationships is often disputed or unclear. But, for the purposes of this analysis, the direction of causality, or even whether the relationship is causal at all, is less important than establishing that high levels of inequality and personal insecurity tend to coexist, and that the relationship of religiosity to personal insecurity is similar to the relationship between income inequality and personal insecurity. This finding supports the use of income inequality as a proxy for personal insecurity (as it relates to religiosity) in cross-national analyses.

[24] Is income inequality correlated to religiosity in this sample and using these measures? In bivariate regression, frequency of prayer and income inequality are highly correlated (r=0.65, P<0.001). The sample of nations included in the analysis shows a good distribution of religiosity and income inequality, with no evidence of systematic bias (Figure 1). The strength of the relationship is similar to that found previously by Norris and Ingelhart using a different sample of nations and measures of religiosity and income inequality, suggesting that it is robust. Notably the U.S., often considered an exception in discussions of secularization, is not particularly far removed for the predicted level of religiosity based on historical income inequality. Note that the nations with highest levels of inequality also tend to be those with the lowest levels of economic development, and therefore univariate analysis cannot exclude secularization effects due to modernization. Nonetheless, these results do suggest that income inequality (and by implication personal insecurity) may be an important factor in explaining variations in religiosity among nations with similar levels of economic development.

Figure 1. Correlation between mean frequency of prayer and income inequality (the mean of the log Gini index for the period 1971-1996)
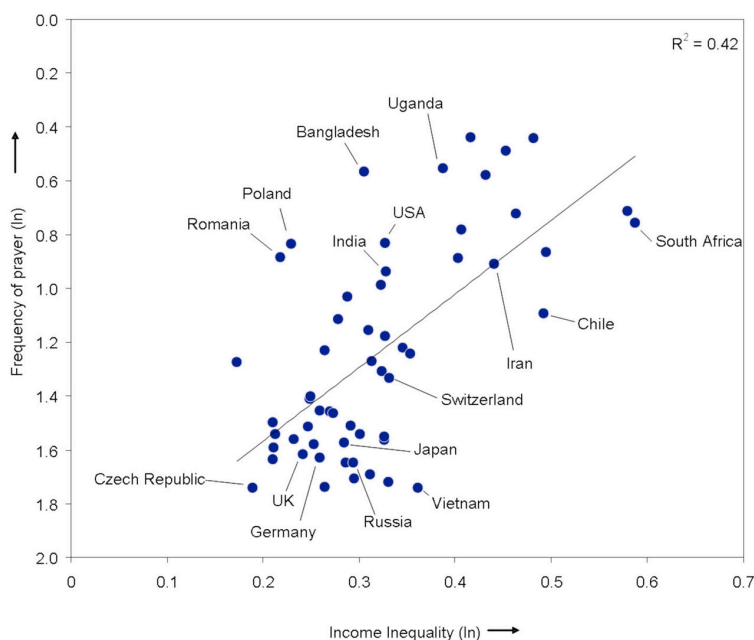
Passionate Dualism or Personal Insecurity?

[25] The preceding analysis shows that a strong statistical association exists between religiosity and indicators of personal insecurity, including homicide rate. Although the hypothesis presented here is that personal insecurity leads to increased religiosity, other causal interactions are possible. As discussed earlier, Jensen has provided evidence that a specific religious worldview labeled "passionate dualism" increases homicide rates. This causal mechanism is specific to interpersonal violence, and thus is unlikely to explain the wider relationship between religiosity and markers related to "societal health."

[26] To demonstrate this, a "passionate dualism" index was created using the method described previously by Jensen. Briefly, data were taken from the second and third wave of the World Values Survey. The index created was the sum of Z scores for 1) the national mean response to the items "How important is God in your life?"; 2) a malevolence score ("Do you believe the devil exists?" + "Do you believe in Hell?"); and 3) a dualism score (the ratio of belief in the devil to belief in God). This dataset included 44 nations, and had a similar correlation to homicide as that reported by Jensen, despite the different data source for homicide ($r^2=0.25$, Figure 2a). Passionate dualism is a robust predictor of national-level homicide rates.

[27] However, although passionate dualism is a stronger correlate of homicide than is the "frequency of prayer" measure of religiosity ($r=0.47$ vs. 0.42, respectively), it is a weaker correlate with infant mortality ($r=0.52$ vs. 0.58, respectively), life expectancy ($r=0.60$ vs. 0.64, respectively), and corruption perceptions ($r=0.62$ vs. 0.74, respectively). This supports the idea that passionate dualism increases homicide rates, but that there is no special connection to other factors related to personal insecurity.

[28] More detailed investigation of the causal relationships between these factors requires either detailed time series (to establish the temporal relationship of changes) or the use of instrumented variables for the religiosity factors (i.e., a variable that is correlated with the independent variables, but which cannot be causally related to the dependent variable). Neither of these exists at the current time. For religiosity, a particular problem in establishing causality is that religious beliefs are largely fixed during early adulthood (Voas and Crockett). Furthermore, these two mechanisms are not exclusive and may in fact reinforce each other: Passionate dualism could increase interpersonal violence, leading to an increase in religiosity.

Personal Insecurity as a Determinant of Religiosity

[29] Although income inequality demonstrates a statistical relationship with religiosity, this correlation may be spurious (potentially due to a third factor that explains both income inequality and religiosity, such as GDP), or it may be inconsequential as a meaningful determinant of religiosity compared with other factors. These possibilities can be investigated empirically using multiple regression techniques. Specifically, assuming that the independent variables are not correlated with each other (i.e. there is minimal colinearity), the results of the multiple regression will give the relationship of each variable with the dependent variable after adjusting for the other independent variables in the model.

[30] A number of dependent variables were selected to represent the competing theoretical macro-level determinants of religiosity. Personal insecurity was represented by income

inequality. RCT was represented by the three indexes of governmental and social influence on religious choice developed by Grim and Finke, namely the Governmental Regulation of Religion (GRI), Governmental Favoritism (GFI), and Social Regulation (SRI), as well as an index of Religious Fractionalization (Alesina et al.). The effects of pluralism on religiosity are complex: greater pluralism may lead to either an increase or a decrease in religiosity. Under RCT, religious heterogeneity leads to increased choice, and hence greater use of religious goods. Arguably, the most important effect of pluralism is to increase the competition among service suppliers for members, and therefore the connection between pluralism and beliefs may be weaker than that between pluralism and participation (McCleary and Barro). However, pluralism could also decrease the attractiveness of participation by reducing the opportunity for networking. The suggestion that pluralism will necessarily lead to greater religiosity has been criticized on several grounds. For example, an apparent monopoly may indicate consensus, rather than repression of belief, and therefore not undermine choice (Bruce). It is also possible that not all heterogeneity is equal. The availability of multiple denominations may increase choice, whereas the presence of multiple religions may undermine claims to universality, and hence reduce belief (Bruce). Pluralism will not equate to choice if religion is linked to ethnicity or language. Furthermore, where religion is linked to ethnic identification, high pluralism could drive affiliation in communities in which inter-ethnic conflict is present. There are also statistical problems with the standard index of pluralism, the Herfindahl Index, which is not scale invariant (the Herfindahl Index gives a higher score when pluralism is present in the form of equally-sized fractions than it does when pluralism takes the form of differently-sized fractions). Nevertheless, the Herfindahl Index is widely used in studies of the social causes of religiosity, and so is included in this analysis for completeness.

[31] Traditional secularization theory was represented by the natural log of mean per capita GDP for the period 1971-1998, and additionally by urbanization. Previous studies have found that, controlling for other factors, highly urbanized nations are more secular than their rural counterparts (see Gill and Lundsgaarde, for example). Other indicators of secularization were also tested (results not shown), but these indicators were all found to be highly correlated with GDP, and only available for a smaller subset of countries. To minimize over-fitting, they were omitted from the final analysis. The indicators of modernization tested but not used were telephone and cell phone connections per capita, school enrolment, and PISA Science Score (see Appendix B for data sources).

[32] Column 1 of Table 2 shows the bivariate correlation of each of the independent variables with the dependent religiosity variable (log mean frequency of prayer). None of the components of RCT correlate significantly with religiosity. Both GRI and SFI approach significance (P=0.114 and 0.103, respectively), but the direction of the association is the opposite of that predicted (as regulation increases, religiosity tends to increase). In pairwise correlations, both markers of modernization (urbanization and per capita GDP) are significantly associated with religiosity in the direction anticipated by theory – as, of course, is income inequality.

[33] Models I-III show the explanatory power of each theoretical approach (RCT, modernization, personal insecurity) taken alone. RCT has no independent power to explain differences in religiosity across this international sample, whereas both modernization and

income inequality explain similar proportions of the variance. Model IV shows that all factors combined can successfully explain over 60% of cross-national variation in religiosity. Importantly, after adjusting for modernization and existential stress, one component of RCT theory (governmental regulation) becomes significant. Furthermore, the relationship is in the direction predicted by RCT theory, with greater regulation leading to less religiosity. Both urbanization and per capita GDP also decrease religiosity, and are statistically significant. The strength of the relationship to religiosity of all these variables (indicated by the magnitude of the standardized correlation coefficient) is similar, and smaller than that of income inequality.

[34] To optimize the model, redundant factors may be removed to reduce the confusion due to over fitting. This was implemented using stepwise removal of factors with P>0.1. The resulting model, Model V, includes five factors. With GFI and SRI eliminated, religious fractionalization becomes significant and so is retained. This analysis finds that increasing pluralism is associated with decreasing religiosity (the contrary of the effect predicted by RCT). This accords with the findings of Halman and Draulans, who demonstrated that in Europe there is a strong inverse relationship between pluralism and both religiosity and religious practice. However, it conflicts with the findings of McLeary and Barro, who find no relationship of pluralism to beliefs across a multinational panel (although they find a positive association with church attendance).

[35] Other than this, the more parsimonious Model V retains the explanatory power of Model IV, with no meaningful changes in correlation coefficients. The lack of effect of other measures of religious control (government favoritism, social regulation) does not necessarily mean that they have no effect on religiosity. The three indicators of regulation are derived from the current political and social situations in the nations assessed. Unlike the measure of income inequality and per capita GDP employed in this analysis, they do not include a component derived from historical conditions. If the regulation indices have changed markedly and inconsistently in different nations over time, and if current religiosity depends in large part upon historical conditions (as it would if religious attitudes are set early in life), then any effect may not be discernable in this analysis.

[36] Furthermore, it should be remembered that this is a diverse sample of nations, and the multivariate analysis gives the average effect of each variable across the full sample. If the effects of regulation are restricted to a subset of nations (the wealthier ones, perhaps), or act in different ways in nations of different socio-economic or cultural background (and hence tend to cancel out in a heterogeneous sample), then the current analysis may not be sufficiently sensitive to detect them. With these caveats in mind, these results do support the hypothesis that personal insecurity (using income inequality as a proxy) is an important determinant of religiosity, independent of other potential causes.

Table 2. Univariate correlations and multivariate models (n=55 countries in all cases)

	Univariate Correlation with Prayer frequency (r)	RCT	Modern-ization	Personal Insecurity	All	Optimal Model
		Multivariate Models (Standardized Correlation Coefficient)				
		I	II	III	IV	V
GRI2003	0.216	0.172			-0.318*	-0.236*
GFI2003	0.017	-0.133			0.057	
SRI2003	0.222	0.078			0.115	
Religious Fractionalization	-0.199	-0.215			-0.122	-0.184*
Urban Population (%)	-0.533**		-0.221		-0.269*	-0.255*
Log GDP (Mean 1971-1996)	-0.569**		-0.393*		-0.325*	-0.321**
Income GINI (Mean 1971-1996)	0.631**			0.631**	0.502**	0.496**
Model r²		9%	34%**	40%**	63%**	62%**

*P<0.1; **P<0.001

[37] Using model V, the predicted "prayer infrequency" values were >1 SD from the actual values in the case of 5 out of the 55 countries; two were less religious than predicted (Vietnam and Estonia), three were more religious (Romania, Singapore, and the United States). Thus, the U.S. remains exceptional even after accounting for the factors included (Figure 2). Vietnam is a strong outlier, with far lower frequency of prayer than predicted. This may reflect genuine cultural effects, but could conceivably result from under-reporting of prayer frequency.

Figure 2. Actual mean prayer frequency versus predicted prayer frequency from Model V
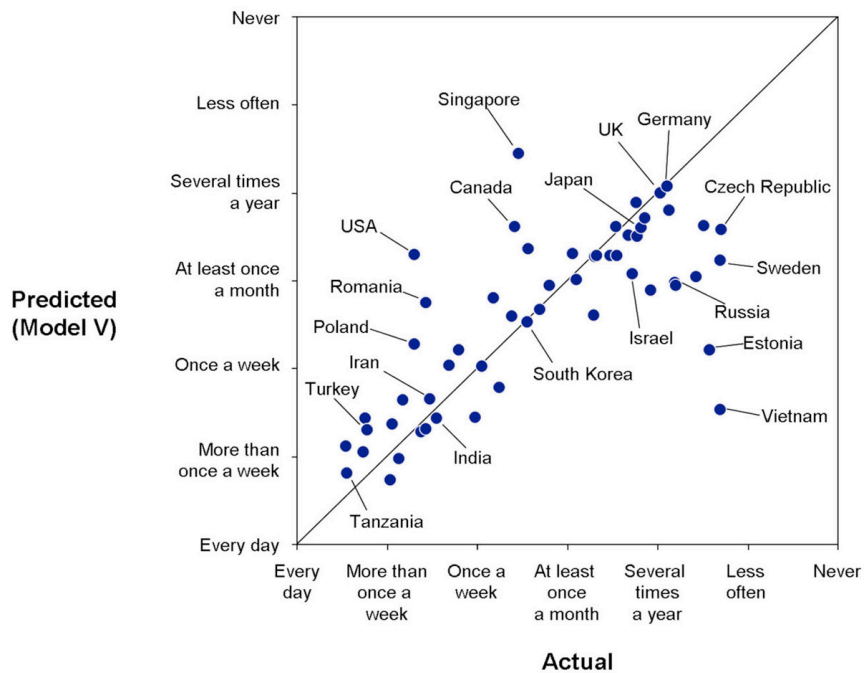
Conclusions

[38] This analysis shows that, across a broad multinational panel, those countries with shorter life expectancy, higher infant mortality, higher violent crime, more corruption, higher abortion rates, and less peace also tend to have higher average levels of personal religiosity, as measured by the frequency of prayer. Furthermore, these indicators of personal insecurity also correlate with income inequality, allowing inequality to serve as a widely available proxy for personal insecurity as it pertains to religiosity. Using this proxy, personal insecurity is shown to be at least as important in the determination of national average religiosity as the factors that are conventionally considered important, such as wealth, urbanization, and governmental regulation of religion (and indeed personal insecurity appears to be the most important determinant).

[39] These results may be compared with the previous cross-national analyses of the relationship between macro-level factors and individual-level religiosity. Mcleary and Barro used a panel estimation methodology on international data, including nations from different regions, different religious composition and heritage, and different time points. As in the present analysis, they found that increased governmental regulation, per capita GDP, and urbanization all decreased religiosity (as measured by church attendance, specific beliefs, and self-declared categorization as a "religious person"). However, they found no effect of pluralism on beliefs. Gill and Lundsgaarde found that religiosity decreased with state welfare spending and urbanization, and increased with religious regulation, but found no effect of pluralism. Halman and Draulans, on the other hand, found a significant negative effect of pluralism, but no effect of GDP, in their analysis of European nations. Halman and Draulans corrected for a number of individual-level factors (such as religious upbringing, the most significant influence), which complicate interpretation of the effects of macro-level factors. The results of the current analysis are broadly comparable with previous studies, but with the novel finding of a major role for income inequality (and, by implication, personal insecurity) in the determination of religiosity.

[40] The data presented here suggest that the inverse correlation between cross-national variation in religiosity and personal insecurity is real, with a robust statistical association found on several indicators and across a broad selection of societies. What could explain this correlation? One possibility that cannot be excluded on the basis of available evidence is that religiosity, or some component part of it, directly or indirectly worsens these key aspects of personal insecurity. Such effects could be case specific and need not be a consequence of religion in its broadest sense. For example, as Jensen has shown, high levels of passionate dualism, but not other forms of religiosity, may directly lead to increased homicide rates. However, this effect seems unlikely to explain the link between religiosity and factors unrelated to violent crime, such as infant mortality, life expectancy, abortion, and corruption.

[41] The alternative possibility, that religiosity is not a cause but a consequence of personal insecurity, appears plausible. Indeed, this may also help explain the inverse correlation between per capita GDP and religiosity observed in this study and in previous studies. The link between modernization and secularization, as measured by personal religiosity, is likely to be at least in part driven by the fact that people in wealthier nations lead more secure lives. However, modernization does not inexorably lead to secularization, and the current

analysis helps to explain this fact. Choices are available to nations with regard to how wealth is spent. The analysis presented here suggests that secularization is greatest among those wealthy nations who chose to spend their wealth in alleviating personal insecurity, a major consequence of which is the transfer of wealth from rich to poor. Thus, in addition to mean wealth, the distribution of wealth is an important determinant of personal security and hence religiosity.

[42] Why might individuals respond to personal insecurity by increasing their religiosity? Placing individuals in stressful situations, such as feelings of loneliness or lack of control, has psychological effects that are linked to superstitious or magical thinking (Whitson and Galinsky; Epley et al,), and might thereby intensify religiosity. Furthermore, Beit-Hallahmi and Argyle identify three mechanisms by which religion reduces stress at the level of the individual. The first is via the provision of social support. In wealthy nations with low income inequality, social support may be provided instead by secular or state institutions. Beit-Hallahmi and Argyle also argue that religion provides spiritual support (i.e. prayer, religious experience, and other private devotions may be experienced as a kind of social relationship that gives similar benefits to human social support) and existential certainty. Indeed, Scheve and Stasavage have shown convincingly that personal religious beliefs can provide a buffer against adverse life events. In a systematic review of studies on the link between religion and happiness, Moreira-Almeida et al. report that the buffering effects of religious involvement on well-being are probably higher for those in stressful circumstances. And a recent interventional study has found that prayer reduced not only reported stress but also blood pressure response to a stress-inducing task (Belding et al.). The results of the current analysis suggest that, when placed in stressful or adverse environments, some individuals are likely to attempt to communicate to supernatural entities either for advice and reassurance or material intervention. Prayer may offer the individual the experience of social support in situations when material social support is insufficient. In societies with high levels of personal security, recourse to prayer (and, presumably, religion), becomes less important. As a result, personal security will show a direct and inverse correlation with religiosity.

[43] Although the model developed provides a reasonably good estimate of the religiosity of most nations, some notable outliers remain. Vietnam is a nation with lower reported religiosity than might be expected given the social conditions. This may reflect local cultural traditions, or it may be an artifact of under-reporting of religiosity. The U.S. is a nation with higher than expected religiosity. Because the U.S. is not an outlier when income inequality is considered alone, it may be that one of the other factors, such as pluralism, operates differently in the U.S. compared with other nations. Studies within the U.S. have found a positive effect of pluralism on religiosity, the opposite of what was found in this cross-national analysis. Alternatively, other factors not included in this analysis may influence religiosity. For example, the U.S. has a large population of recent immigrants. Immigrants may be expected to retain the religious attitudes that they developed before emigrating, so a large influx from nations with low personal security might be expected to affect mean religiosity.

[44] One consequence of link between personal insecurity and religiosity demonstrated in this paper is that state-level actions to reduce inequality and insecurity directly (for example, by health care provision or welfare payments) may have the effect of decreasing religiosity.

This would explain the observation that nations with higher welfare payments as a proportion of GDP also tend to have less religious populations (Gill and Lundsgaarde). The size of the welfare state is the most important determinant of the magnitude of relative poverty in rich western democracies, and it may be that states that invest heavily in a welfare state reduce income inequality and thereby decrease religiosity (Brady). Conversely, religiosity could in fact be a contributory factor to societal-level income inequality. Such an effect is theoretically plausible given the body of work which links religiosity to reduced demand for state-mediated welfare distribution (i.e., the decommodification of labor). For example, Scheve and Stasavage find that the difference in religiosity between Canada and France likely leads to an increase in welfare spending equivalent to 6% of GDP. Plausibly, circular causality may operate, in which income inequality increases religiosity and in turn reduces the demand for income redistribution.

[45] In conclusion, the current analysis ties together and explains two apparent paradoxes. First, the observation that modernization, in terms of average material wealth, appears linked to secularization in some countries but not others. The key to this paradox is that it is not simply average wealth, but also the distribution of wealth and the degree to which wealth is used to improve average personal security, which in large part determines religiosity. Second, the observation that religion, although generally believed to have a pro-socializing effect on the individual level, is associated on the macro level with societal ill health. This is most likely because personal religiosity is in part a response to adverse social environments, but that aggregate religiosity does not significantly ameliorate them.

Appendix A: Measuring Religiosity

[46] The interpretation and understanding of the secularization paradigm depends critically upon what precisely is meant by the term "secularization," and in particular in distinguishing between religious participation (e.g., church attendance) and religious belief (i.e., whether an individual believes in God, and whether that belief has any importance in their life). Frequently, participation and belief are used interchangeably, although in practice many believers do not participate, and many participators do not have any consequential religious beliefs. The interindividual variances in these two factors translate into differences at the macro level. Huber finds that, in poorer countries especially, non-believers are more likely to participate in religious activities. Since a likely driver of the higher ratio of participation to belief in poorer countries is the provision by religious institutions of social and psychosocial support, there also exists the potential for significant confusion if this metric is used to investigate the relationship of religiosity to personal security. Furthermore, countries with a less religious population may well develop alternative mutual support mechanisms not founded on religious institutions (unions, for example). Religious participation may therefore have little to do with personal piety, especially in nations where economic and social stress is more common. Average participation rates may be an indicator of the strength of religion at a societal level, but are not necessarily an indicator of individual-level belief. If participation is used as an operational measure of belief, the result will be an overestimation of belief in poorer regions.

[47] In major international surveys assessing social attitudes, religious belief is captured in a number of ways. Typically, respondents are asked whether they believe in God, how

important belief is in their lives, and how often they engage in acts of prayer. The simple dichotomous question belief/non-belief in God obscures a great deal that is of interest when assessing the link between personal religiosity and societal functioning. For example, around 25% of U.S. "believers" believe in a remote, impersonal God, according to the 2006 Baylor Religion Survey. These individuals are characterized as follows:

> Believers in a Distant God think that God is not active in the world and not especially angry either. These individuals tend towards thinking about God as a cosmic force which set the laws of nature in motion. As such, God does not "do" things in the world and does not hold clear opinions about our activities or world events (26).

[48] The presence of such a belief is likely to have little consequence for behavior or attitudes. Although important from a philosophical standpoint, from a functional perspective such a belief is similar to non-belief. Of note, believers in a distant God tend to be of high social status (they are much more likely to have high income and/or be college educated), and therefore have greater personal security.

[49] The second measure of personal religiosity is the self-declared importance of religion in an individual's life using, for example, a 10-point interval rating scale. This measure may or may not relate to the likelihood of the individual's religious beliefs affecting their behavior. Furthermore, there is a large measure of subjectivity inherent in the response.

[50] The least subjective survey-based measure of personal religiosity is the frequency of prayer outside of communal religious services. Several distinct types of prayer can be recognized. Poloma and Pendleton identify four prayer types in a sample of U.S. Christians: meditative, ritualist, petitionary and colloquial – of which only petitionary and colloquial are intercessory in nature. However, all forms of prayer other than ritualist are frequently predicated upon a specific form of belief, namely, that the respondent believes in the existence of a god who is not only interested in the individual, but is prepared to listen to direct attempts at communication and, perhaps, respond in some way. An analysis of prayers left in a public prayer book at Johns Hopkins University Hospital revealed that 22% expressed thanks to God, 28% were requests of God, and 28% were prayers to both thank and petition God (Cadge and Daglian). These common forms of prayer are an appeal to a supernatural entity for reassurance, advice, or possibly intervention in the material world. The frequency of prayer indicates the intensity of this belief and also the frequency with which a given individual encounters events that trigger such an appeal. Notably, believers in the distant God of the Baylor survey are no more likely to pray than are self-declared atheists.

[51] Unlike other self-report measures of the strength of an individual's belief, prayer incurs opportunity cost (i.e., it requires an investment of time that could be spent engaged in other activities). It is a standard economic assumption that individuals value their time and, therefore, will only devote time to prayer if they believe that it will provide a benefit, either natural or supernatural. Therefore, frequency of recourse to prayer provides a more objective measure of the intensity of belief, since it indicates that the individual believes that the payoff that can be obtained is worth the time invested in the act of prayer. The usual caveats over the objectivity of self-reported behavior apply.

[52] Frequency of prayer is therefore employed in the current analysis as the measure of religiosity. This enables the following specific hypothesis to be tested: that a common response to personal insecurity is to adopt and strengthen belief in supernatural agent(s) that monitor and can respond to intercession (such response occurring either in the natural world or after death), because such a belief system can mitigate the stress associated with adverse life events and situational anxiety. This analysis does not test whether the relationship between religiosity and personal insecurity is affected by dominant religion within a state. Following the example of Scheve and Stasavage, the analysis assumes that the most relevant cleavage in the modern world is between the religious and non religious.

Appendix B: Data Sources

Religiosity

[53] **Frequency of prayer** data were derived primarily from the fourth wave of the World Values Survey and supplemented with data from the International Social Survey Religion II. Participants were asked "How often do you pray to God outside of religious services?" and responded on a 7-point scale from "Every day" to "Never." Fractions in each category were weighted by the category value (i.e., the fraction of respondents giving "Never" as an answer was multiplied by 7) and summed. Nine countries participated in the International Social Survey, but not in the World Values Survey. For the 21 countries that participated in both, regression between the WVS survey item and the equivalent in the ISS ("About how often do you pray?") is very high ($r^2=0.93$) For the 9 countries without WVS data, values were imputed from this correlation. The resulting dataset included 67 countries, although income inequality and other data were not available for all. They range in mean prayer frequency from 1.4 (Iraq) to 5.7 (Czech Republic, Sweden), with higher numbers indicating less prayer. Because the scale is non-linear, the natural logarithm of the mean values was taken to better reflect the actual opportunity cost of prayer activities. For ease of discussion, the sign of correlations and coefficients with the prayer variable are reversed, so that positive correlations indicate that the dependent variable increases with increasing prayer frequency.

Indicators of Personal Insecurity

[54] There is evidence that an individual's personal beliefs and attitude to religion are crystallized in young adulthood. Voas and Crockett show that, in Britain at least, the cohort effect dominates – i.e., religiosity declines from one generation to the next, but religious attitudes within a generation do not change as it ages. To the extent that personal insecurity affects personal religiosity, for a large part of the population (especially the elderly) it will be historical insecurity, rather than current situation, that determines the level of belief. Because of the generational effect anticipated in the relationship of personal insecurity to religiosity, the precedent of Jong-Sung and Khagram was followed, with mean values from long time series of personal insecurity indicators employed wherever available. This has the added advantage of reducing statistical noise due to inter-annual fluctuations and measurement error.

[55] **Life Expectancies** are mean life expectancies for both sexes for the period 1950-2000, inclusive. The data are those generated by the Population Division of the Department of

Economic and Social Affairs of the United Nations Secretariat, and were obtained from the World Resources Institute.

[56] **Infant Mortality** is the infant mortality rate – the probability of a child dying between birth and 1 year – averaged for the period 1960-2000. Data are provided by United Nations Children's Fund, and were obtained from the World Resources Institute.

[57] **Control of Corruption** Index is a measure of "perceptions of corruption, conventionally defined as the exercise of public power for private gain" (Kaufman et al.). Positive scores indicate better governance. Data were generated by the World Bank and obtained from the World Resources Institute. Data used in this paper were the means for the period 1996, 1998, 2000, and 2002. Communism and the transition from Communism to a free market economy had a significant effect on the levels of corruption in post-communist nations (Sandholtz and Taagepera). It therefore represents a significant confounding factor in the assessment of the relationship of corruption to income inequality or religiosity. For this reason, former Eastern Bloc nations were excluded from the dataset used.

[58] **Perception of Corruption** is the Corruption Perceptions Index 2001, developed by Lambsdorff for Transparency International. It reflects the perceptions of business people, academics and country analysts, with positive scores indicating a lower level of corruption. As with the Control of Corruption dataset, former Eastern bloc nations were excluded.

[59] **Homicide Rates** are for total completed, recorded, intentional homicide, and are from the seventh U.N. Survey on Crime and the Operations of Criminal Justice Systems (UNODC). Data used were the mean for the years 1998, 1999 and 2000.

[60] **HIV Prevalence** is the 2005 estimate of the percentage of individuals aged 15-49 years with HIV. Data were obtained from the 2006 U.N. Human Development Report.

[61] **Abortion Rate** is the mean of estimated legal and illegal induced abortions in 1997 and 2005 (Henshaw et al.; Sedgh et al.). Data are available only regionally. For the purposes of comparison, country-level religiosity data were grouped by region and the mean taken. The Soviet Union introduced a highly liberal abortion law in 1987 allowing easy access to early abortion (Ketting). As a result, abortion rates in Eastern Europe in 1995 were extremely high, and halved by 2007. No other region saw such large changes in rates, which suggests that the available data may not be historically representative. Furthermore, other policies effectively made abortion a socially acceptable form of birth control, since contraception was not widely available. For these reasons, data from Eastern Europe were excluded.

[62] **Global Peace** is the Global Peace Index, developed by the Institute for Economics and Peace and derived from a compilation of 23 qualitative and quantitative indicators. It combines internal and external factors ranging from a nation's level of military expenditure to its relations with neighboring countries and the level of respect for human rights. Data were the mean of country-level scores for 2008 and 2009 (the 2007 report covered a restricted range of countries). For the purposes of this analysis, the index was reverse scored, so that high scores indicate less peace.

[63] **Prevalence of Curable STDs** is the average for the years 1995 and 1999 from 9 global regions. As with abortion rate, country-level religiosity data were grouped by region and

averaged. Prevalence data are taken from World Health Organization reports on the prevalence of chlamydia, gonorrhea, syphilis, and trichomoniasis.

[65] **Child Well Being** data are for 21 Organization for Economic Co-operation and Dvelopment nations and are provided in the UNICEF Innocenti Report Card 7. Data are the overall scores, based on the mean ranking on 6 items (material well being, health and safety, educational well being, family and peer relationships, behaviors and risks, subjective well being).

[66] **Non-Vehicle Property Crime** data are from the International Victims of Crime Survey (van Kesteren et al.), and cover the period 1992-2000. The survey covered a range of criminal activities. Data on car, motorbike, and bicycle theft were not used because the opportunity for vehicle crime is dependent on the presence of vehicles, which would be expected to vary according to per capita wealth. Included were crimes of burglary, attempted burglary, robbery, personal theft, sexual incidents and assaults, and threats. These were summed and the mean taken for all three waves of the survey (1992, 1996 and 2000), where available. Data for 1989 were omitted for all countries because of the high incidence of missing data. Data from Northern Ireland, Scotland, and the Basque region were also omitted in favor of data from England and Spain.

Determinants of secularization

[67] **Governmental and Social Regulation of Religion** data are the International Religion Indexes provided by Grim and Finke. Government regulation is "the restrictions placed on the practice, profession, or selection of religion by the official laws, policies, or administrative actions of the state" (7). Government favoritism is "subsidies, privileges, support, or favorable sanctions provided by the state to a select religion or a small group of religions" (8). Social regulation is "the restrictions placed on the practice, profession, or selection of religion by other religious groups, associations, or the culture at large" (8). All indexes are scored 1-10, with higher numbers indicating increasing regulation, favoritism, or control.

[68] **Religious Fractionalization** is the Herfindahl index, and was developed by Alesina et al. It reflects the probability that two randomly selected individuals from a population belong to different groups, with higher numbers indicating greater pluralism.

[69] Modernization was operationalized as **Per Capita GDP,** in this case the natural log of gross domestic product (GDP) per capita, averaged for 1971–1996, as calculated by Jong-Sung and Khagram. **Urbanization** data are from the 2006 U.N. Human Development Report. Also tested as indicators of modernization were telephone and cell phone connections per capita (averaged for the period 1990-2004, provided by The International Telecommunications Union, and available from the U.S. Census Bureau, school enrollment (2006 U.N. Human Development Report), and PISA Science score (2006 data).

[70] **Income Inequality** is the average value of the adjusted Gini index for the period of 1971–1996, as calculated by Jong-Sung and Khagram. The Gini coefficient ranges from 0 to 1, with a Gini of 0 representing perfect equality and a Gini of 1 meaning that only one person or household has the total income in the country. Some caveats need to be observed with this index. Most importantly, the size of the economic unit may impact the measured

level of inequality: A large nation is more likely to have economically diverse regions than a small one. Furthermore, individuals may assess their own income relative not only to others in their own country, but also relative to people in nearby or even distant nations. In the European Union, for example, individuals assess their income by comparing it with standards elsewhere in the E.U. A wealthy individual in one of the poorer E.U. members will be only middle income compared with average wealth in one of the richer states, and may feel dissatisfied as a result (Fahey).

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