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MORE FOR GOD-LESS FOR CLIMATE
ASSOCIATION OF RELIGIOSITY WITH STRINGENCY OF CLIMATE CHANGE POLICIES

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ABSTRACT
The national contributions to global climate change commitments vary considerably among countries. This study explores the cross-country difference in climate change policy stringency and its association with respective cultural differences. Particularly, we hypothesize that more religious countries incline to have lesser stringent climate change policies. Our empirical evidence using ordinary least square estimates provide support for this supposition. Estimates using instrumental variables and further evidence from individual-level analysis with a panel data of up-to 220758 observations over the past three decades confirm our main findings. The results hold up to a bunch of robustness checks. Our findings may be of relevance to policymakers looking to design climate change policy reforms.

Keywords: climate change policy, religiosity, clean energy, climate change and religion, disease prevalence.

1. INTRODUCTION

Although risks of climate change impacts are predicted to be higher for underprivileged people and communities in developing countries [1], climate change poses a dire threat to all countries alike with estimated economic damage amounting to more than 20% of global GDP annually [2].

Contrary to the pressing need for climate change actions by the entire global community, there lies a significant lag and unwillingness of certain countries to take responsibility and start acting meaningfully. As such, the national contributions to the global climate change commitments vary considerably among countries, both in terms of political commitments and emission behavior [3]. In this context, it would be important to understand *is there any significant factor that can explain the different stringency level of climate change policies in various countries*? We consider this question here. A number of economics studies refer corruption, political instability, legal origins, the current level of democracy and historical experience with democracy as some of the significant determinants of environmental and climate change policies [4], [5], [6], [7], [8].

However, we propose to look beyond these aspects. Climate change is much more than a technical, political or legal issue. A number of studies such as DeMenocal [9] and Adger, Barnett [10] document that a society's response to climate change is mediated by culture. Our focus is on the role of religiosity in shaping the climate change policies across the globe which, to the best of our knowledge, has not previously been explored empirically in the literature.

Religion is an important dimension of culture [11] and is regarded as the cultural belief universally present across human societies [12], [13]. It is also known as the most common and powerful form of individually chosen but collectively sustained belief of humans [14]. Since Weber [15] highlighted the role of religion in social change and the rise of modern capitalism, an increasing number of studies have established the impact of religion on economic growth and human well-being (see for example [16], [17], [18], [12]). In another interesting stream of inquiries, literature has reported a long history of conflicts between religiosity and scientific progress of the countries [19], [20].

Bénabou, Ticchi [21] reason that secularized regime of power in a country often stimulates decline in religiosity and allows unrestricted scientific progress. On the other hand, the theocratic regime represents the extreme religiosity that attempts to hamper the adoption of new scientific knowledge that may capable of eroding the existing religious beliefs in a country. For instance, climate change is the recent case of push-back against science in the United States following the previous impeding of evolution concepts and biotechnology [21]. Also, various other studies highlight

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that the religious affiliation of legislators impacts their support for national and foreign policies [22], [23]. Confirming such findings in the context of climate change regulations, Newman, Guth [24] establishes that the religious beliefs of the US house representatives impact their support for environmental policies and that ultimately influences congressional action on the environmental policy.

We draw on the literature discussed above to derive on our main hypothesis. We posit that a country's ability to adopt stringent climate change policies is influenced by the degree of religiosity in that country. To understand this impact, assume a country with a higher percentage of the religious population. This religious population believes in a literal rendition of religious doctrines leading to a stronger belief in the supreme power of God, its competence to controls the fate of humans and earth and general distrust in scientific authority. In this religious setting, climate science which is a new scientific knowledge conveying important findings of climate change and essential human actions for its mitigation are likely to be seen as a contradiction of religious doctrines.

Such people may see climate change and environmental concern as rival religion that challenges God's world sustaining prudence and humanity's God-given dominance over nature. Such matters are also often viewed by the public as a notion that harms the poor by lessening fossil fuel-development prospects. Thus, religious people are likely to show no to low support for environmental and climate change policies and resistance to public spending on environmental conservation efforts. Ultimately, as political decisions reflect the attitude of the general public, we expect a highly religious country to have lesser stringent climate change policies.

Using a cross-section of up to 63 countries, our ordinary-least square estimates provide support for this hypothesis. In particular, we find strong evidence that variations in the stringency of climate change policies are negatively influenced by religiosity. Potential endogeneity is dealt with using historical disease prevalence as the instrument for religiosity. Additional evidence using IV-2sls estimates confirm our baseline findings. Moreover, individual-level analysis with a panel data of up-to 220758 observations over the past three decades is consistent to main results. Our result holds for a bunch of robustness checks including the indirect effect of environmental perception, other potential determinants of climate change policymaking, updated CLIMI, alternative index to measure climate change stringency, and alternative proxies to measure religiosity. Our findings may have policy implications. Policymakers may want to take into the cultural constraints as explained by this study while designing the climate change policy reforms.

2. EMPIRICAL APPROACH AND DATA

2.1 Estimating Equation

The following model is regressed to understand how a climate change policy is related to the impact of religiosity:

$$\mathrm{CLIMI}_i = \alpha + \beta\ \mathrm{Religiosity}_i + \gamma'\ \mathrm{CV}_i + \epsilon_i \quad (1)$$

where CLIMI_i is the Climate Laws, Institutions and Measures Index of country i and $\mathrm{Religiosity}_i$ is a measure of religiosity in country i. CV_i is a set of control variables included to account for the influence of geographic factors and ϵ_i is an unobserved error term.

2.2 Endogeneity issue and instrument variable strategy

The correlation estimates established with equation (1) may subject to endogeneity bias arising from reverse causality, measurement error or omitted variable. We thus use the instrumental variable approach with historical disease prevalence used as the instrument. Under the identifying restriction assumption that disease prevalence does not affect climate change policies directly other than through influencing religiosity, this exclusion restriction, we believe is an apt strategy for addressing the issue of reverse causality and omitted variable bias.

Our rationale for using disease prevalence index rests on the idea that a large exposure to parasite stress increases the degree of religiosity. Consider a primeval society faced with the real menace of infectious and life-threatening diseases such as plague, dysentery and tuberculosis. With open sewers, no running water and proper knowledge of hygiene, it is likely that this sort of society would consider diseases a punishment from God, having devilish sources and caused by hidden sins of the past. Behaving in a moral way and seek the forgiveness of the High God are some of the apparent cures. Thus, it is probable that such a society will focus to construct impressive religious structures in order to facilitate the adoption of religious values. A similar approach is verified by a number of existing studies such as Fincher and Thornhill [25].

2.3 Construction of variables and data sources

Measuring the extent of religiosity

For measuring religiosity, we follow an approach similar to that of [26] and focus on measuring five important aspects of people's religious orientation: (i) believe in God, (ii) religious attendance, (iii) regard themselves as religious person, (iv) importance of God, (v) importance of religion. Data are taken from the World Value Surveys (WVS) and use all available survey waves (1981-1984, 1989-1993, 1994-1998, 1999-2004, 2005-2009 and 2010-2014) which provide public opinion responses for a maximum of 99 countries. In particular, respondents answer to the following questions respectively: "do you believe in God?", "how often do you attend religious services?", "independently of whether you attend religious services or not, would you say you are: a religious person?", "how important is God in your life?" and "how important is religion in your life?". We first take a simple average of each religiosity aspects across individuals to represent the mean level of religiosity in a country on each of these aspects. Then, we construct the first principal component and use it as a composite index representing the overall level of religiosity in a country. Figure 1 shows the spatial distribution of religiosity in our sample.

The Climate Laws, Institutions and Measures Index (CLIMI)

For measuring the country's policy response to climate change risk, we use Steves et al. (2011)'s the Climate Laws, Institutions and Measures Index (CLIMI). CLIMI is a composite index that focuses on policy inputs such as climate laws, institutions and measures and does not take into account the policy outcomes (e.g. emissions). CLIMI thus ensures to measure a country's commitment to reduce emissions through climate change mitigation policies and their preparedness to reduce future emissions by building institutional capacity. CLIMI varies between 0 and 1, where higher values correspond to stricter climate change policies.

Instrument and other variables

We focus to measure the extent of disease prevalence during the pre-industrial period by using disease prevalence index of Murray and Schaller (2010)'s. We control for geographic heterogeneity among countries by controlling for latitude, terrain roughness, mean precipitation, mean elevation, the average distance from the coast or river, and a dummy for landlocked and island countries. Also, for controlling for continent fixed effects, we include continent dummies in our regression equation.

Figure 1: Spatial distribution of religiosity across the globe

3 RESULTS AND DISCUSSION

3.1 Main Findings

Table 1 reports the OLS estimates, it shows that the stringency of climate change policies varies negatively with religion: higher religiosity impedes stringency of climate change policies. This relationship is statistically significant at the 1% level even after controlling for geographical influences and continent fixed effects.

Column 1 to column 5 report univariate relationship between each aspect of religiosity and CLIMI. The first principal component is used in column 6 to represent religiosity. Standardized coefficient of all five aspects of religiosity and the first principal component is significant at the 1% level. One unit increase in religiosity decreases the CLIMI by more than 50%. We add geographic controls in column 6 and also control for continent fixed effects in column 7. Standardized coefficient of religiosity remains highly significant, effect size reduces marginally though.

Religiosity is able to explain around one-fourth of the variations of the dependent variable in our sample, the number goes up to 50% once geographic controls and continent fixed effects are included in the estimation equation. Figure 2 shows the partial regression line for the effect of religiosity on climate change policies while controlling for the influence of geographic factors and continent fixed effects. Noticeably, the partial regression line shows that the strength of religiosity is a robust predictor of climate change policy stringency. Therefore, result estimates in this section lend initial support to our hypothesis.

Table 1: Religiosity and climate change policies: OLS estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable = CLIMI							
Religious Person	-0.42***							
	(-4.44)							
Belief in God		-0.44***						
		(-3.39)						
Importance of God			-0.56***					
			(-5.67)					
Religious Attendance				-0.35***				
				(-3.37)				
Importance of Religion					-0.54***			
					(-5.68)			
Religiosity (1st Principal Component)						**-0.51*** (-4.92)**	**-0.40*** (-3.79)**	**-0.41*** (-3.46)**
Geographic Controls	No	No	No	No	No	No	Yes	Yes
Continent Fixed dummies	No	No	No	No	No	No	No	Yes
R-squared	0.18	0.20	0.32	0.13	0.29	0.26	0.45	0.50
No. of observations	63	59	63	63	63	63	59	59

Notes: Standardized beta coefficients are reported. Robust standard errors are reported in the parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. The intercept estimates are not shown. Standard robust standard errors are used. t-statistics is reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

Furthermore, we repeat the regression by using IV-2sls with disease prevalence index as our instrument, with results estimates reported in table 2. Findings of table 1 are summarized again (unstandardized (b) coefficient) in panel A. Panel B reports the IV-2sls estimates and first-stage estimates are presented in panel C. The first-stage regression estimates show that the coefficient of disease prevalence is significant across all specifications at 1-5% level. The first stage F-statistic for the excluded instrument is noticeably higher than the rule of thumb value of 10 across all specifications, implying that the disease prevalence index is an appropriate instrument. IV estimates in panel B (column 1-3) show that the coefficient of religiosity is significant and larger than its counterpart in OLS estimates. We, thus, continue to use both OLS and IV-2sls as our preferred estimators.

We then conduct a number of other diagnostic tests. First, we conduct the Kleibergen-Paap' under identification test. This under identification test is an LM test of whether the excluded instruments are "relevant" i.e. correlated with the endogenous regressor. We are able to reject the null hypothesis at a 1% significance level indicates that the model is identified.

We now move to check for weak identification using Kleibergen-Paap Wald rk F statistic, the null hypothesis of "weak identification" is that excluded instrument (diseases prevalence) is correlated with the endogenous regressor (religiosity), but only weakly. The test statistics are compared against the Stock-Yogo (2005) critical values, as follows: 16.38 (10% maximal IV size), 8.96 (15% maximal IV size) and 6.66 (20% maximal IV size). The test from column 1-3 suggests that the null hypothesis for weak identification is simply rejected up-to 15% decision rule.

Next, we provide weak-instrument-robust inference using the Anderson-Rubin and the Stock-Wright Wald tests. These methods test the significance of the endogenous regressor in the structural equation. Both the tests are able to reject the null hypothesis at the 1% level of significance in all cases, thus providing evidence that our endogenous regressor is relevant.

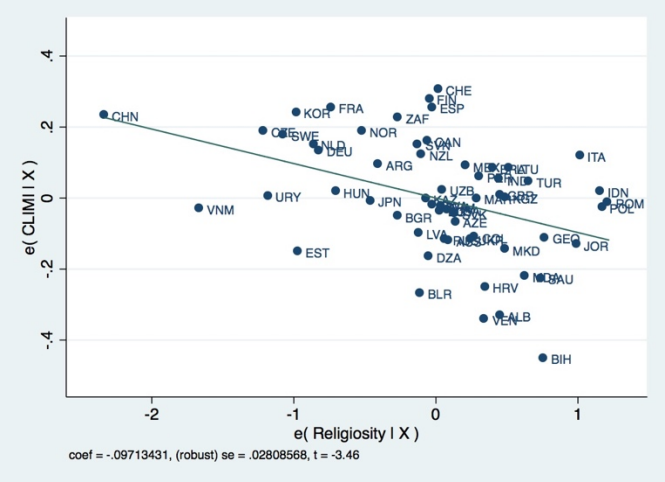

Figure 2: Partial regression leverage plot: CLIMI and Religiosity. The specification includes geographical covariates and continent fixed effects. Each country is labeled with its 3-digit ISO code.

3.2 *Testing for exclusion restriction credibility*

For being able to perform the over-identification tests, we include an additional instrument. The joint null hypothesis of the test is that the instruments are valid instruments (i.e. whether instruments are correlated with the error term) and that the excluded instruments are correctly excluded from the estimated equation. Accordingly, we use the historical presence of state religion as an additional instrument. Particularly, we use the presence of state religion in 1900 as an additional instrument with data from Barro and McCleary [11]. The measure is a binary variable, 1 representing the presence of religion and 0 otherwise.

We thus now use two instruments: disease prevalence and state religion with results estimates reported in column 4 and column 5 of Panel B, C and D in table 2. As is shown in post diagnostic tests in panel D, the null hypothesis for over-identification tests cannot be rejected at conventional levels of significance in either specification, providing partial evidence that the exogeneity condition for our instrument is satisfied.

Overall, the IV-2SLS estimations provide findings that are consistent with the previous OLS results.

3.3 *Sensitivity and Robustness checks*

We now move to check the robustness and sensitivity of our baseline estimates by conducting a number of checks as mentioned below:

- Checking for the indirect effect of environmental perception
- Controlling for other potential determinants of climate change policy making
- The sensitivity of main findings to the updated CLIMI and climate change cooperation index
- Sensitivity to the use of alternative proxies to
- measure religiosity

Results estimates for all the robustness checks using OLS and IV-2sls regression estimates are shown in Panel I and Panel II of appendix table[1]. It is evident across all specifications and in both the results panels that some of these variables are significantly correlated with CLIMI.

Coefficient of religiosity, however, remains highly significant and the size of its coefficient also remains stable. Accounting for these factors, nonetheless, has no effect on our estimates of interest. Our hypothesis is thus again confirmed, religiosity encumbers stringency of climate change policies.

4. EVIDENCE FROM THE WORLD VALUES SURVEYS (WVS)

In this part of the analysis, we provide additional evidence by investigating the association of climate change policy stringency and religiosity across individuals in the world.

For measuring religiosity, we follow the same approach as in country-level estimates. By using data from all available waves of the WVS, we measure five important aspects of people's religious orientation: (i) believe in God, (ii) religious attendance, (iii) regard themselves as religious person, (iv) importance of God, (v) importance of religion. We construct the first principal component of religiosity for each individual and use it as a composite index representing the overall level of religiosity for that individual.

As our dependent variable (stringency of climate change policies in a country) cannot be observed at the individual level. We thus rely on indicators which capture individuals' attitude towards climate change and the government's role in addressing this. Thus, the following three indicators are used: (i) support for public good, (ii) low demand for long-term goods (government should reduce environmental pollution but it should not cost me any money) and (iii) affinity towards global efforts (need for international agreement for handling country's environmental problems). Tjernström and Tietenberg [27] use similar indicators.

Table 2: Main Findings: OLS and IV regression

Panel A: OLS estimates					
Dependent Variable= CLIMI		(1)	(2)	(3)	
Religiosity (1st principal component)		-0.13***	-0.10***	-0.10***	
		(-4.85)	(-3.79)	(-3.46)	
Geographic Controls		No	Yes	Yes	
Continent Dummies		No	No	Yes	
R-squared		0.28	0.45	0.50	
No. of observations		59	59	59	
Panel B: IV-2SLS estimates					
Dependent Variable= CLIMI	Instrument= Disease Prevalence Index			Instrument= Disease Prevalence Index + State Religion in 1900	
	(1)	(2)	(3)	(4)	(5)
Religiosity (1st principal component)	-0.19***	-0.23***	-0.32***	-0.19***	-0.20**
	(-4.08)	(-3.57)	(-4.40)	(-3.54)	(-2.36)
Geographic Controls	No	Yes	Yes	Yes	Yes
Continent Dummies	No	No	Yes	No	Yes
No. of observations	58	58	58	58	58
Panel C: 1st stage estimates for IV-2SLS					
Disease Prevalence	0.82***	0.70**	0.57***	0.53***	0.43**
	(5.57)	(4.80)	(3.36)	(3.01)	(2.01)
State Religion				0.47**	0.50**
				(2.01)	(2.05)
R-squared	0.36	0.48	0.50	0.53	0.57
Panel D: Post Estimation Diagnostics					
Endogeneity Test	2.10	5.35	4.76	3.48	2.37
	(0.14)	(0.02)	(0.02)	(0.06)	(0.12)
1st stage F-Statistics for excluded instrument	31.04	23.05	11.28	13.22	6.55
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Under identification test: Kleibergen-Paap rk LM	16.98	15.99	8.46	19.49	12.38
statistic: Chi-sq	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Weak identification test: Kleibergen-Paap Wald rk	31.04	23.05	11.29	13.22	6.55
F statistic					
Anderson-Rubin Wald test (chi-square)	17.54	20.04	9.06	8.96	10.47
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Stock Wright LM S statistic (chi-square)	12.49	14.87	9.88	14.98	10.76
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
OID (p-values)				1.300	2.091
				(0.25)	(0.15)

Notes: The table reports IV regression estimates where the unit of observation is a country. Robust standard errors are used, t-statistics are reported in the parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. The intercept estimates are not shown.

We control for characteristics of an individual: age, gender, marital status, employment status, educational level and income. Geographic heterogeneity among countries is controlled by controlling for latitude, mean precipitation, mean elevation, the average distance from the coast or river, and a dummy for landlocked and island country. We control for continent specific effects by including continent dummies in our regression equation. Table 3 reports the results estimates using the OLS estimator. Consistent with our hypothesis, the individual level results indicate that religiosity employs a significant negative influence on climate change policy indicators. Overall, the additional individual-level results are consistent with our previous cross-country results, implying that the negative

[1] Appendix is not provided with the draft paper submission. It is available however on request.

association between climate change policy stringency and religiosity can be identified even at the individual level.

Table 3: Evidence from the World Value Surveys (WVS): Individual level estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Support for public goods			Low demand for long-term goods			Affinity towards global efforts	
Religiosity	-0.25*** (0.03)	-0.23*** (0.03)	-0.20*** (0.02)	-0.10*** (0.01)	-0.11*** (0.01)	-0.10*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)
Individual characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave-fixed dummies	No	Yes	Yes	No	Yes	Yes	-	-
Year-fixed dummies	No	No	Yes	No	No	Yes	No	Yes
R-squared	0.04	0.05	0.06	0.04	0.04	0.06	0.06	0.06
Adjusted R-squared	0.04	0.05	0.06	0.04	0.04	0.05	0.06	0.06
No. of observations	220758	220758	220758	75447	75447	75447	41194	41194

Note: OLS estimates are reported. The dependent variables (stringency of climate change policies) are based on the following three questions from the World Value Survey: Incomes should be made more equal, Government should reduce environmental pollution but it should not cost me any money, 'country's environmental problems can be solved without any international agreements to handle them. Robust standard errors clustered at the regions within a country are reported in the parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. The intercept estimates are not shown.

5. CONCLUSION

This study tests the hypothesis that the degree of religiosity in a country influence its ability to adopt stringent climate change policies. Using cross-country data covering developed countries, post-communist transition economies, developing countries and small island states, we find that stringency of climate change policies is negatively and robustly influenced by people's religious participation and beliefs. The evidence is consistent using instrument regression estimates with historical disease prevalence as an instrument for religiosity. Additional estimates using individual-level panel data of up-to 220758 observations over the past three decades deliver the same results. This result holds when controlling for the indirect effect of environmental perception, other potential determinants of climate change policymaking, updated CLIMI and alternative index to measure climate change stringency, and to the use of alternative proxies to measure religiosity. Religiosity, therefore, appears to matter for the adoption of stringent climate change policies. Our findings may be of relevance to policymakers looking to design climate change policy reforms.

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