

## Religion and economy: An empirical study\*

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### **Abstract**

This study analyzes the relationship between religions and economic development by using country-level panel data. This research contributes to the literature by examining the economic effect of religious denomination and the nonlinear relationship, and by using split sample regressions. The regression analysis shows that i) Islam has a negative effect on the level of GDP, but is positively related to GDP growth, although the regression results are not robust; ii) there exists an inverted U-shaped relationship between Protestantism and GDP level; and iii) the economic effects of religion are different across the levels of income. Overall, the regression analysis shows a substantial contrast between Western religions and non-Western religions. The empirical results suggest that the economic effect of religion depends on the peculiar characteristics of each religion and the mediating role of the level of economic development.

*Keywords:* Religion, Economic development, Panel data

*JEL Classification:* Z10, Z12

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# 1 Introduction

This study empirically examines the relationship between religion and the economy by investigating country-level panel data. The focus of this paper is on the effect of religions on economic development and the role of income level in the effect.

The relationship between religion and economy has long been studied. Smith (1776) interpreted participation in religious sects as an investment in human capital (Anderson, 1988) and Weber (1930) argued that the Protestant ethic contributed to the rise of capitalism. Recently, scholars analyze the issue of religion and economy from various viewpoints (for a review, see Iyer, 2016). Miller (2002) discusses the organizational and competitive aspects of religion from the perspectives of management, sociology, and economics. Park et al. (2014) build on Bourdieu's cultural capital model (Bourdieu, 1984) to introduce workplace-bridging religious capital, one form of cultural capital that has bridging characteristics. Verter (2003) views religion as positional goods within a competitive symbolic economy and proposes a concept of spiritual capital based on Bourdieu's work. Ekelund and Hebert (2010) review Tollison's economics of religion which integrates public choice analysis into the microeconomic analysis of religion. Lee (2018) examines the effect of religious freedom on international trade by using a modified gravity model.

The analysis of religion and economy can be divided into some categories. According to Iannaccone (1998), there have been three types of studies of the relationship between religion and economy. First, some scholars evaluate economic policies and behavior from a religious perspective. This kind of study has been conducted by theologians and philosophers. The second type of study seeks to explain the effect of religion on economic performance. The positive effect of Protestant ethics on economic development claimed by Weber is a classical example. Third, economists apply economic theory to understand religious behavior. The best known example is the club model of religion (Iannaccone, 1988; Iannaccone, 1992; Iannaccone, 2012), which thinks of religion as a club good that displays positive returns to participatory crowding. The club model argues that efficient religions with rational members benefit from

stigma, self-sacrifice, and behavioral restrictions, which screen members and thus mitigate free-rider problems. This theory explains the success of strict religions (Iannaccone, 1992; Berman, 2000; Chen, 2010). However, there is a counterargument reported by McBride (2015) that religious groups permit some free riding to increase future memberships.

According to another categorization offered by McCleary and Barro (2006a), the research of religion and economy can be classified into two types of studies: one views religion as a dependent variable and another treats religion as an independent variable. First, theories of religion as a dependent variable include demand-side models such as the secularization model and supply-side models such as the religion market model. The secularization model argues that the demand for religion decreases as economic development increases due to increased opportunity costs (Stark and Bainbridge, 1985). Empirical studies have confirmed the secularization thesis by using country-level or individual-level analysis (Barro and McCleary, 2003; Chen, 2010; Lipford and Tollison, 2003; McCleary, 2008; McCleary and Barro, 2006a; McCleary and Barro, 2006b; Paldam and Gundlach, 2013). McCleary (2008) suggests four indicators of the influence of economic development on religion: education, opportunity costs, life expectancy, and urbanization. However, some studies raise doubts on the validity of the secularization theory, using a theoretical model of religious competition (McBride, 2010) or a panel data analysis (Becker and Woessmann, 2013). Moreover, Buser (2015) provides evidence of a positive relationship between income and church attendance. The religion market model suggests that religiosity is affected by state regulation and religious pluralism. Stark and Iannaccone (1994) stress the supply-side of religion to explain the secularization of European countries. McCleary and Barro (2006b) show that religiosity increases with the existence of a state religion, decreases with the presence of state regulation of the religion market, and has no relationship with religious pluralism which, however, raises church attendance. Gruber (2005) finds that there is a positive relationship between religious market density and religious participation. Second, theories of religion as an independent variable tend to hold that religion affects economy by fostering certain personal traits or shaping social networks.

Since the current study analyzes the effect of religion on the economy, it is categorized as the second type of study in Iannaccone (1998) and the

study of religion as an independent variable in McCleary and Barro (2006a). The details of the theories and previous studies are discussed in the next section. Then, the empirical analysis is presented, starting with a data and method description followed by the findings. Finally a summary and conclusion is provided.

## 2 Previous studies

How does religion affect economic performance? Scholars suggest several mechanisms through which religion can influence economic outcomes.

First, religion shapes and reinforces people's attitudes and character traits, and also generates human capital. Barro and McCleary (2003) suggest that religious beliefs in hell and heaven enhance traits that are conducive to economic outcomes, while Lipford and Tollison (2003) show that religious participation affects individual preferences, which reduces individual incomes. Guiso et al. (2003) find that religious beliefs are related to attitudes towards cooperation, government, women, legal rules, thrift, and the market economy. Dana (2009) shows that religion influences perceptions of entrepreneurship. Hilary and Hui (2009) provide evidence that religiosity increases risk aversion affecting managerial decision making, organizational behavior, and financial market outcomes.

Some studies are specific to a particular religion. Several studies show that many Jewish persons obtain certain values from the religion that improves their human capital (Chiswick, 1983; Meng and Sentence, 1984; Tomes, 1983; Tomes, 1985). Furnham and Koritsas (1990) demonstrate that the Protestant ethic is associated with certain types of personalities. Becker and Woessmann (2009) find that Protestantism leads to economic prosperity because instruction in reading the Bible generates human capital. Alesina and Giuliano (2011) show that Protestantism decreases and Catholicism increases preferences for redistribution. Kumar et al. (2011) show that gambling propensity is stronger in Catholic-dominant regions.

Second, religion functions as social capital and a social safety net. Social capital refers to social trust across social networks. Putnam (2000)

suggests that religious people are more involved in volunteering. Delhey and Newton (2005) find the positive impact of Protestant religious traditions on social trust. Similar results are obtained for Catholic affiliation among Latin Americans (Branas-Garza et al., 2009), for German Protestants (Traummuller, 2009), and for liberal Protestants (Daniels and von der Ruhr, 2010). Scheve and Stasavage (2006) show that religion and welfare spending are substitute mechanisms. Chen (2010) demonstrates that religious intensity reduces credit constraints.

While most studies of social capital regard religion as an important medium for generating social capital, some offer different perspectives. Berggren and Bjornskov (2011) find a negative relationship between religiosity and social trust and claim that religion may create social division. Lee (2017) shows a negative relationship between bonding social capital measured by religiosity and media freedom.

Third, religion influences institutions and social contexts. Glahe and Vorhies (1989) find that Judae-Christianity promotes economic development by fostering the private ownership of property and political democracies. Heath et al. (1995) show the economic impact of religions through their influence on institutions. Dolansky and Alon (2008) find that religious diversity indicating a welcoming culture stimulates foreign direct investment (FDI).

The mechanisms discussed above can make religion a determinant of economic performance. There have been empirical studies supporting a positive relationship between religion and economic development (for example, see Barro and McCleary, 2003; Grier, 1997; Guiso et al., 2003). However, it has been noted that the regression results are not robust across models (Noland, 2005). In addition to statistical problems such as lack of data or model inaccuracy, part of the reason may be that the effect of religion differs across religious denominations or (individual or country) income levels.

Some studies show that the effect of religion depends on religious affiliation. Guiso et al. (2003) find that the effect of religious beliefs on economic attitudes differs depending on religious denominations. Dana (2009) shows that religions value entrepreneurship to different degrees and different religions exhibit dissimilar patterns of entrepreneurship. Audretsch et al. (2013) find that while some religions such as Islam are conducive to self-employment choices, others such as Hinduism and

Buddhism are not. Several studies find that Protestantism or Christian religions are more positively related to economic growth (Grier, 1997; Guiso et al., 2003; Wang and Lin, 2014), and Muslim culture is not favorable to economic development (Guiso et al., 2003; Rubin, 2011). In contrast, other studies find that Islam has a neutral relationship or a positive relationship with economic growth (Noland, 2005; Pryor, 2007).

This study examines the effect of various religious denominations on the economy as well as the mediating role of income levels. A nonlinear relationship is also a possible reason for the non-robustness, which is also investigated by the empirical analysis.

### 3 Data and methods

This section describes the data set, the variables, and the regression techniques used in the current study. In order to examine the economic effect of religion, we examine country-level unbalanced panel data of 112 countries over the period 1995-2014 by regression analysis.

The basic model for the regression analysis is

$$\text{gdp} = b_0 + b_1 \text{religion} + b_2 \text{control} + e \quad (1)$$

where  $e$  refers to a classical error term. “gdp” refers to GDP variables such as the natural log of GDP per capita (gdpl) and the rate of GDP growth (gdpg). “religion” refers to the religion fraction variables such as Buddhist (buddhist), Catholic (catholic), Hindu (hindu), Muslim (muslim), Orthodox (orthodox), and Protestant (protestant). “control” refers to the control variables such as the employment-to-population ratio (labor), the government expenditure on education as percent of GDP (edux), the gross capital formation as percent of GDP (capital), and the sum of exports and imports of goods and services as percent of GDP (trade). In order to examine multicollinearity of religion variables, we conduct the regression analyses using each variable separately as well as using all the religion variables simultaneously.

The data used in this study are taken from United Nations (UN) databases and are supplemented with data from World Bank and OECD

for “trade.” For the dependent variables, both the level of per capita GDP and the GDP growth rate are employed. For the explanatory variables, this study includes seven religion fractions (Buddhist, Catholic, Hindu, Muslim, Orthodox, and Protestant). In addition to the main variables, labor, education, capital, and trade openness are included as control variables. These are often-cited factors determining economic development in the relevant literature.

The panel data analysis could not use fixed effects or random effect model since the religion data have been collected at intervals of about 10 years. Thus the analysis is based on pooled regressions. We adjust the regression estimates using the White method (Arellano, 1987; White, 1980) to correct for heteroskedasticity and autocorrelation. To overcome the increase in R-Squared with the addition of insignificant terms to the model, adjusted R-Squared values are used and reported.

A nonlinear relationship is examined since it may exist between religion and economic performance. For example, religion can affect believers' entrepreneurial activity and improve economic outcomes, but when a particular religion is dominant in a country, it may not maintain the economic vitality any more. Tu et al. (2011) report an inverted U-shaped relationship between religious inputs (time and money spent in the temple) and household income. In order to determine the nonlinear relationship between religion and economic development, this study uses the quadratic regression model:

$$\text{gdp} = b_0 + b_1 \text{religion} + b_2 \text{religion}^2 + b_3 \text{control} + e. \quad (2)$$

For the quadratic regression,  $b_1$  indicates the overall linear trend in the relationship between religion and economic development across the data, and  $b_2$  implies the direction of curvature. If  $b_2$  is positive, the relationship is concave upward, and if it is negative, the relationship is concave downward. For example, if  $b_1$  is positive and  $b_2$  is negative, and both are statistically significant, an inverted U-shaped relationship can be supported. However, it is not a sufficient condition for the inverted U-shaped relationship. In order to guarantee the inverted U-shaped relationship, an inflection point beyond which the curve becomes downward sloping should exist and this point should be within the range of acceptable or realistic values of the variable (Herold et al., 2006, p.384).

In the regression analysis, we check the coefficient estimates as well as the condition for the inflection point.

The effect of religion on economic performance may be different depending on the economic development of the country. Bettendorf and Dijkgraaf (2010) use country-level panel data to find that the effect of church membership on income is positive for high-income countries and negative for low-income countries. This study uses a split-sample approach to investigate whether the economic effect of religion is different across levels of economic development. We split the sample into two groups—high income countries and low income countries—based on the income level of countries as measured by the natural log of GDP per capita (gdpl). We calculate each country's average income over the twenty-year period, rank the countries according to the average values, and divide the countries into two equal size groups, those with country income above the median and those below the median. Then we perform regression analysis on the two groups separately to determine if there are significant differences between the groups.

The split-sample approach is advantageous in that it can correct an endogeneity problem. In theory, religion and economic development can affect each other. An endogeneity problem arises in the empirical analysis of the effect of religion on economic performance, because economic factors can also affect religion. Bettendorf and Dijkgraaf (2011) show that both religion and income affect each other. The endogeneity problem can be avoided if the economic effect of religion is different among the countries with different degrees of economic development. Since there is in principle no statistical reason to believe that the relationship is different across the groups of countries, an observation of different relationships would indicate the pure effect of religion in explaining economic performance while controlling for the reverse effect. Another benefit of the split-sample approach is that even though individual estimates of the religion coefficients might be biased, the estimated difference in the coefficients between groups would be unbiased since the bias is supposed to be the same for the two groups.



Table 1. Summary statistics

Variables	Full sample			High income			Low income		
	Median	Mean	s.d.	Median	Mean	s.d.	Median	Mean	s.d.
Buddhist	0.00	0.05	0.19	0.00	0.02	0.07	0.00	0.10	0.27
Catholic	0.11	0.24	0.29	0.16	0.31	0.31	0.02	0.16	0.24
Hindu	0.00	0.02	0.11	0.00	0.02	0.06	0.00	0.04	0.16
Muslim	0.00	0.13	0.26	0.00	0.08	0.21	0.04	0.20	0.31
Orthodox	0.00	0.06	0.21	0.00	0.03	0.15	0.00	0.10	0.26
Protestant	0.54	0.47	0.39	0.60	0.55	0.38	0.07	0.34	0.38
gdpl	8.33	8.27	1.62	9.56	9.57	0.94	7.09	6.99	1.04
gdpg	3.96	3.96	4.96	3.28	3.24	3.93	4.70	4.63	5.67
Labor	56.40	56.05	10.06	56.80	56.46	7.61	55.50	55.32	13.45
Capital	23.37	23.82	7.71	23.73	24.38	6.19	22.74	23.24	8.95
edux	4.46	4.50	1.58	4.87	4.78	1.17	3.85	4.17	1.90
Trade	84.13	90.76	48.70	93.55	104.83	56.49	75.61	77.49	35.19

Notes: The table shows the summary statistics of the variables used in the study. s.d. refers to standard deviation. The variables of buddhist, catholic, hindu, muslim, orthodox, protestant refer to the religion fractions. gdpl refers to the natural log of GDP per capita, gdpg to the rate of GDP growth, labor to the employment-to-population ratio, edux to the government expenditure on education as percent of GDP, capital to the gross capital formation as percent of GDP, and trade to the sum of exports and imports of goods and services as percent of GDP.

Table 1 shows the summary statistics for the variables used in the empirical study. According to the table, the fractions of Protestants and Catholics are higher in the high income group, while the fractions of the others are higher in the low income group.

## 4 Results

This section presents the empirical results of the study. As a preliminary step, we show the scatter plots and the regression lines of religion and GDP level in Figure 1. The scatter plots and the regression lines of religion and GDP growth are shown in Figure 2.

Figure 1. Religion & GDP level (Buddhist, Catholic, Hindu, Muslim, Orthodox, and Protestant)

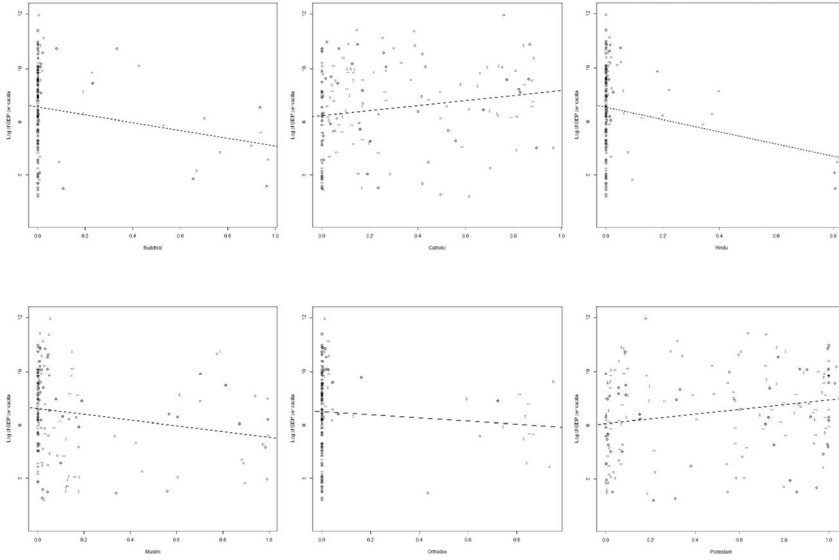
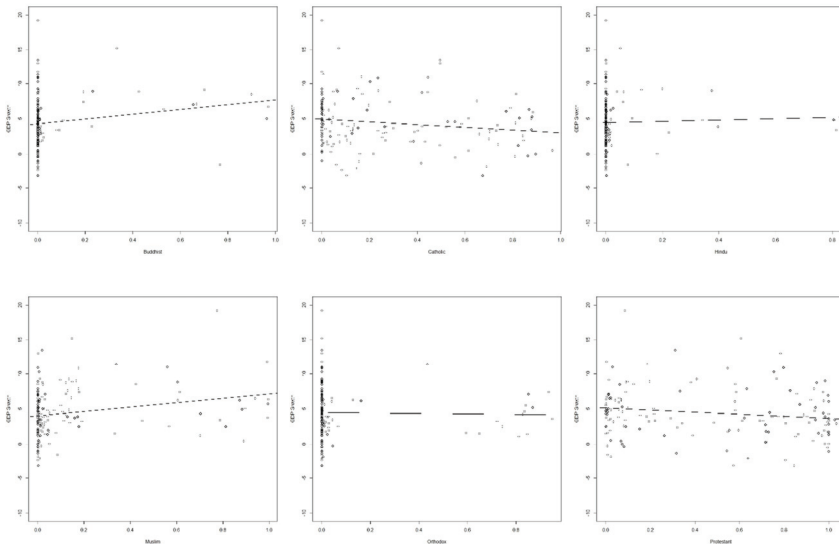


Figure 2. Religion & GDP growth (Buddhist, Catholic, Hindu, Muslim, Orthodox, and Protestant)



It can be observed from the figures that the relationship between religion and GDP level is positive for Catholic and Protestant, and negative for Buddhist, Hindu, Muslim, and Orthodox. This is consistent with Weber (1930)'s view of Protestant ethic and the view of Islam as anti-market (Guiso et al. 2003). In contrast to the relationship between religion and GDP level, the relationship between religion and GDP growth is shown to be positive for Buddhist, Hindu, and Muslim, and negative for Catholic, Orthodox, and Protestant. For Muslim, it might be the case that Islam's historical legacy is not conducive to growth, but the effect has now worn off (Noland, 2005, pp.1220–1221).

For the relationship between religion and GDP level, the pooled regression results are shown in Table 2. The results support the negative effect of Buddhist, Muslim, and Protestant religions on GDP level. While the coefficient estimates of Buddhist are statistically significant across the models, the results for Muslim and Protestant are not robust to model specification. The coefficient estimates of Muslim and Protestant turn insignificant when excluding the other religions.

Table 2. Linear regression results: Level of GDP per capita

	gdpl						
Buddhist	-2.39*** (-4.87)						-3.29*** (-4.90)
Catholic		0.53 (1.50)					-0.50 (-1.21)
Hindu			-0.61 (-0.67)				-0.29 (-0.42)
Muslim				-0.69 (-0.84)			-1.79* (-2.11)
Orthodox					-0.70 (-1.63)		-1.04 (-1.73)
Protestant						0.09 (0.30)	-0.91* (-2.64)
Labor	0.07*** (4.94)	0.06*** (4.14)	0.06*** (4.12)	0.06*** (3.79)	0.05*** (3.64)	0.06*** (3.91)	0.05*** (3.11)
Capital	0.02 (0.83)	0.01 (0.64)	0.01 (0.59)	0.01 (0.61)	0.01 (0.39)	0.01 (0.56)	0.02 (1.09)
Edux	0.23 (1.78)	0.25 (1.79)	0.26 (1.86)	0.22 (1.59)	0.24 (1.67)	0.26 (1.88)	0.10 (0.84)
Trade	0.00* (2.11)	0.00 (1.22)	0.00 (1.37)	0.00 (1.40)	0.00 (1.33)	0.00 (1.30)	0.00 (4.16)
adj. R <sup>2</sup>	0.31	0.23	0.21	0.22	0.22	0.21	0.39

Notes: The table shows the results of the linear regressions. Figures are regression coefficient estimates, and *t* values are shown in parentheses below coefficient estimates. \*\*\*, \*\*, and \*, respectively, indicate significance levels at 0.1%, 1%, and 5% levels. The adjusted R squared values are also presented.

Table 3 shows the regression results of the relationship between religion and GDP growth. According to Table 3, the positive effect of Muslim on GDP growth is observed by the regression. However, the positive effect of Muslim turns insignificant when the other religions are included. Note that the positive relationship between Muslim and GDP growth observed by the regression might be due to the effect of convergence. Accordingly, regression analysis including the log of the initial level of GDP per capita is conducted in order to check the convergence effect. However, the convergence effect is not confirmed by the regression. The regression with the initial level of GDP does not show a different result, which is not reported in this paper for simplicity. Given that Muslim is found to be related to the low level of GDP and the high level of GDP growth at the same time, the results of Muslim might be a statistical fiction.

Table 3. Linear regression results: Growth rate of GDP

		<b>gdp</b>					
Buddhist	2.86 (0.96)					0.89 (0.30)	
Catholic		-0.56 (-0.81)					-1.35 (-1.32)
Hindu			4.21 (1.40)				4.14 (1.39)
Muslim				3.05** (3.03)			1.17 (0.88)
Orthodox					-1.28 (-1.21)		-1.97 (-1.70)
Protestant						-1.20 (-1.81)	-1.31 (-1.65)
Labor	0.04 (1.09)	0.04 (1.19)	0.04 (1.33)	0.04 (1.33)	0.02 (0.74)	0.05 (1.46)	0.02 (0.80)
Capital	0.08 (1.77)	0.09 (1.98)	0.09 (1.98)	0.09* (2.04)	0.08 (1.73)	0.10* (2.24)	0.07 (1.67)
Edux	-0.62* (-2.30)	-0.60* (-2.16)	-0.60* (-2.16)	-0.39 (-1.58)	-0.69* (-2.54)	-0.53* (-2.16)	-0.44 (-1.79)
Trade	0.02*** (4.41)	0.02*** (4.72)	0.02*** (4.72)	0.02*** (4.51)	0.02*** (4.94)	0.02*** (5.03)	0.02*** (4.45)
adj. R <sup>2</sup>	0.59	0.59	0.59	0.62	0.59	0.60	0.61

Notes: The table shows the results of the linear regressions. Figures are regression coefficient estimates, and *t* values are shown in parentheses below coefficient estimates. \*\*\*, \*\*, and \*, respectively, indicate significance levels at 0.1%, 1%, and 5% levels. The adjusted R squared values are also presented.

The quadratic regression results of the relationship between religion and GDP level are reported in Table 4. The quadratic regression results support an inverted U-shaped relationship between Protestant religion and GDP level, since their linear terms are positive and the quadratic terms are negative. In order to check if the results guarantee the inverted U-shaped relationship, we plot the relationship using the coefficient estimates.

Table 4. Quadratic regression results: Level of GDP per capita

	gdpq						
Buddhist	-3.39						-5.36
	(-1.06)						(-1.18)
buddhist <sup>2</sup>	1.11						3.15
	(0.33)						(0.71)
Catholic	2.25						-0.72
	(1.49)						(-0.44)
Catholic <sup>2</sup>	-2.03						0.81
	(-1.15)						(0.42)
Hindu		2.56					5.56
		(0.18)					(0.33)
Hindu <sup>2</sup>		-8.35					-8.86
		(-0.23)					(-0.21)
Muslim				-3.74			-4.70
				(-1.37)			(-1.24)
Muslim <sup>2</sup>				3.96			4.50
				(1.36)			(1.05)
Orthodox					2.74		4.55
					(1.13)		(1.22)
Orthodox <sup>2</sup>					-4.04		-5.69
					(-1.37)		(-1.36)
Protestant						4.93***	1.01
						(3.58)	(0.46)
Protestant <sup>2</sup>						-4.89***	-1.77
						(-3.72)	(-0.90)
Labor	0.07***	0.06***	0.06***	0.06***	0.06***	0.06***	0.06**
	(4.91)	(3.68)	(3.94)	(3.71)	(3.91)	(3.68)	(2.97)
Capital	0.02	0.01	0.01	0.00	0.01	0.02	0.02
	(0.81)	(0.47)	(0.60)	(0.26)	(0.36)	(0.90)	(0.85)
edux	0.24	0.24	0.26	0.20	0.25	0.25*	0.15
	(1.78)	(1.71)	(1.84)	(1.50)	(1.82)	(2.06)	(1.37)
Trade	0.00*	0.00	0.00	0.00	0.00	0.00	0.00**
	(2.14)	(1.32)	(1.28)	(1.65)	(1.37)	(1.41)	(3.12)
adj. R <sup>2</sup>	0.30	0.22	0.19	0.22	0.22	0.30	0.39

Notes: The table shows the results of the quadratic regressions. Figures are regression coefficient estimates, and *t* values are shown in parentheses below coefficient estimates. \*\*\*, \*\*, and \*, respectively, indicate significance levels at 0.1%, 1%, and 5% levels. The adjusted R squared values are also presented.

Figure 3 shows the relationship between Protestant and GDP level reported by the quadratic regression, in which the horizontal axis represents religion and the vertical axis represents the level of GDP. The inflection point is within the acceptable range in Figure \ref{fig:quad02}. The figure implies that the inverted U-shaped relationship is supported for the relationship between Protestant and GDP level. Although the linear regression seems to support the negative effect of Protestant religion on GDP level, the case might be that the level of GDP per capita initially increases as the Protestant share of the population increases, reaches a peak, and then declines. That is, too much of the religion is related to the lower level of GDP. This result can be explained in terms of the secularization model that high levels of economic performance weaken religious commitment.

Figure 3. Protestant & GDP level

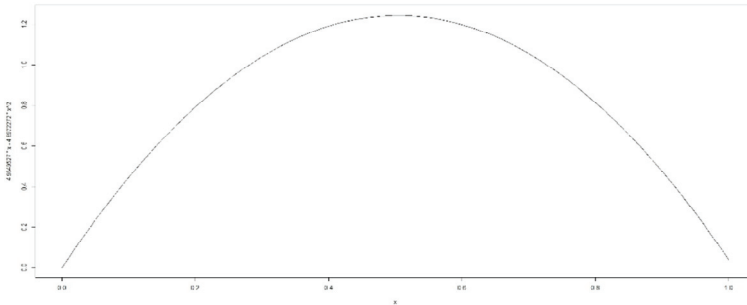


Table 5 reports the quadratic regression results of the relationship between religion and GDP growth. Since significant coefficient estimates of religion are not observed in the table, the inverted U-shaped relationship between religion and GDP growth are not supported by the quadratic regressions.

Table 5. Quadratic regression results: Growth rate of GDP

	gdp						
Buddhist	6.08						-16.64
	(0.84)						(-1.45)
Buddhist <sup>2</sup>	-5.37						23.05
	(-0.56)						(1.60)
Catholic		-3.43					-5.43
		(-1.21)					(-1.62)
Catholic <sup>2</sup>		3.39					4.29
		(0.98)					(1.05)
Hindu			31/92				10.80
			(1.86)				(0.32)
Hindu <sup>2</sup>			-72.51				-25.04
			(-1.65)				(-0.28)
Muslim				9.21*			11.47
				(2.47)			(1.78)
Muslim <sup>2</sup>				-7.99			-13.79
				(-1.78)			(-1.77)
Orthodox					5.54		-4.14
					(0.89)		(-0.47)
Orthodox <sup>2</sup>					-7.99		1.17
					(-1.06)		(0.12)
Protestant						-3.15	-3.55
						(-1.09)	(-0.74)
Protestant <sup>2</sup>						1.94	1.90
						(0.71)	(0.43)
Labor	0.04	0.05	0.03	0.04	0.03	0.05	0.01
	(1.08)	(1.29)	(0.95)	(1.29)	(0.93)	(1.53)	(0.44)
Capital	0.08	0.10*	0.09*	0.11*	0.08	0.10*	0.14*
	(1.64)	(2.08)	(2.11)	(2.41)	(1.70)	(2.16)	(2.14)
edux	-0.63*	-0.60*	-0.62*	-0.36	-0.67*	-0.53*	-0.40
	(-2.30)	(-2.27)	(-2.27)	(-1.46)	(-2.62)	(-2.14)	(-1.45)
Trade	0.01***	0.02***	0.01**	0.02***	0.02***	0.02***	0.02***
	(3.84)	(5.05)	(4.19)	(4.19)	(5.08)	(4.86)	(4.13)
adj. R <sup>2</sup>	0.58	0.58	0.59	0.62	0.59	0.60	0.58

Notes: The table shows the results of the quadratic regressions. Figures are regression coefficient estimates, and *t* values are shown in parentheses below coefficient estimates. \*\*\*, \*\*, and \*, respectively, indicate significance levels at 0.1%, 1%, and 5% levels. The adjusted R squared values are also presented.

The split sample regression results of the relationship between religion and GDP level are shown in Table 6. According to the results, the difference between high income countries and low income countries is substantial, although the models including all the religions tend to provide insignificant results across the two groups. The Buddhist religion has a positive and significant influence on GDP level in low income countries but not in high income countries. The effect of Catholic is significantly negative in the low income group only. For Hindu, the effect on GDP level

Table 6. Split sample regression results: Level of GDP per capita

		gdpl						
High income	Buddhist	-2.29 (-0.90)					-0.61 (-0.26)	
	Catholic	0.33 (1.27)					-0.20 (-0.52)	
	Hindu			-2.15* (-2.57)			-0.50 (-0.76)	
	Muslim				-2.08*** (-4.07)		-2.51*** (-3.74)	
	Orthodox					-0.34 (-1.62)	-0.46 (-1.76)	
	Protestant						-0.09 (-0.43)	
	Labor	0.09*** (6.54)	0.09*** (7.38)	0.09*** (7.43)	0.09*** (6.94)	0.09*** (7.44)	0.09*** (7.97)	0.08*** (6.36)
	Capital	-0.03 (-1.63)	-0.03 (-1.78)	-0.03 (-1.60)	-0.02 (-1.24)	-0.03 (-1.78)	-0.02 (-1.58)	-0.00 (-0.23)
	edux	-0.02 (-0.17)	-0.01 (-0.10)	-0.05 (-0.47)	0.03 (0.36)	-0.02 (-0.20)	-0.01 (-0.10)	0.02 (0.32)
	Trade	0.00 (0.98)	0.00 (0.29)	0.00 (0.33)	0.00 (1.44)	0.00 (0.26)	0.00 (0.23)	0.00 (1.68)
adj. R <sup>2</sup>	0.50	0.51	0.54	0.58	0.50	0.49	0.59	
Low income	Buddhist	1.20* (4.24)					-1.14 (-0.99)	
	Catholic						-1.05 (-1.02)	
	Hindu			103.50** (4.99)				4.76 (0.57)
	Muslim				2.00* (4.46)		-0.68 (-0.74)	
	Orthodox					0.19 (0.47)	-1.32 (-1.23)	
	Protestant						-0.84* (-3.75)	
	Labor	-0.01 (-1.96)	-0.00 (-0.26)	-0.02 (-2.23)	-0.00 (-0.54)	-0.00 (-0.06)	-0.00 (-0.81)	-0.02 (-1.71)
	Capital	-0.02 (-2.73)	-0.03 (-1.87)	-0.00 (-0.20)	0.00 (0.25)	-0.01 (-0.83)	-0.02 (-2.23)	-0.00 (-0.14)
	edux	-0.11 (-1.42)	-0.08 (-1.07)	0.05 (1.01)	0.06 (1.43)	-0.04 (-0.50)	-0.01 (-0.22)	-0.17 (-0.95)
	Trade	-0.00 (-0.24)	0.00 (2.01)	0.02** (4.70)	0.02* (3.97)	0.00 (1.74)	0.00 (0.56)	0.01 (0.93)
adj. R <sup>2</sup>	0.70	0.62	0.82	0.82	0.50	0.71	0.26	

Notes: The table shows the results of the split sample regressions. Figures are regression coefficient estimates, and *t* values are shown in parentheses below coefficient estimates. \*\*\*, \*\*, and \*, respectively, indicate significance levels at 0.1%, 1%, and 5% levels. The adjusted R squared values are also presented.



is found to be negative in high income countries but positive in low income countries. The Muslim religion has a negative effect in high income countries and a positive effect in low income countries. For Protestant, a negative effect is found to be significant only in low income countries. For the high income group, Hindu and Muslim show negative effects. For the low income group, Catholic and Protestant have negative effects, while Buddhist, Hindu, and Muslim exert positive effects.

Table 7 presents the split sample regression results of the relationship between religion and GDP growth. For Buddhist and Hindu religions, positive effects are significant in high income countries, while negative effects are found in low income countries. However, their positive effects turn insignificant when the other religions are included. Muslim has a negative effect only in the high income group when all the other religions are included.

Table 7. Split sample regression results: Growth rate of GDP

		<b>gdp</b>						
High income	Buddhist	17.56*					23.90**	
		(2.70)					(3.03)	
	Catholic	-0.27					-0.31	
		(-0.32)					(-0.26)	
	Hindu		5.56**				9.78***	
			(2.80)				(4.61)	
	Muslim			2.39				-6.67**
				(1.51)				(-3.16)
	Orthodox				-0.59			-0.03
					(-0.89)			(-0.03)
Protestant						-0.75	-1.11	
						(-1.03)	(-1.20)	
Labor	-0.06	-0.03	-0.02	-0.03	-0.03	-0.02	-0.06	
	(-1.22)	(-0.73)	(-0.57)	(-0.69)	(-0.62)	(-0.40)	(-1.47)	
Capital	0.06	0.07	0.07	0.06	0.07	0.09	0.11	
	(1.13)	(1/03)	(0.98)	(0.94)	(0.96)	(1.27)	(1.88)	
edux	0.04	-0.02	0.09	-0.07	-0.04	-0.03	0.42	
	(0.17)	(-0.07)	(0.35)	(-0.28)	(-0.17)	(-0.12)	(1.98)	
Trade	0.01**	0.02***	0.02**	0.02***	0.02***	0.02***	0.01*	
	(2.87)	(5.35)	(5.13)	(4.28)	(5.44)	(5.37)	(2.61)	
adj. R <sup>2</sup>	0.73	0.69	0.70	0.69	0.69	0.69	0.73	

	Buddhist	-17.51*					7.31
		(-4.45)					(1.36)
	Catholic	-3.78					3.36
		(-1.71)					(0.92)
	Hindu		-397.92*				-9.94
			(-5.23)				(-0.28)
	Muslim			-6.15			1.89
				(-3.18)			(0.45)
	Orthodox				1.40		5.15
					(0.76)		(1.48)
Low income	Protestant					4.85	2.34
						(2.81)	(0.91)
	Labor	-0.01	0.06	0.06	-0.00	0.04	0.00
		(-0.64)	(1.43)	(2.41)	(-0.18)	(0.81)	(0.15)
	Capital	0.53*	0.04	0.06	0.07	0.15	0.12
		(6.88)	(0.41)	(1.01)	(0.78)	(1.89)	(14.6)
	edux	0.68	-0.06	-0.88	-0.74	0.12	-1.12
		(1.63)	(-0.16)	(-3.29)	(-2.94)	(0.29)	(-3.39)
	Trade	0.03	-0.01	-0.07	-0.06	-0.03	0.03
		(1.36)	(-0.96)	(-4.15)	(-3.01)	(-2.26)	(1.16)
	adj. R <sup>2</sup>	0.55	0.12	0.67	0.39	0.02	0.31

Notes: The table shows the results of the split sample regressions. Figures are regression coefficient estimates, and *t* values are shown in parentheses below coefficient estimates. \*\*\*, \*\*, and \*, respectively, indicate significance levels at 0.1%, 1%, and 5% levels. The adjusted R squared values are also presented.

## 5 Conclusion

This study analyzes the relationship between religion and economic development by investigating country-level data. The current research contributes to the literature by examining the economic effect of religious denomination and the nonlinear relationship, and by using the split sample regressions.

The linear regressions show that the relationship between religion and GDP level is negative for Buddhist, Muslim, and Protestant religions. For the relationship between religion and GDP growth, the positive effect of Islam is observed by the regression analysis. It is noteworthy that the Muslim religion has a negative effect on the level of GDP, but is positively related to GDP growth, although these results are not robust across regression models. The nonlinear analysis supports the inverted U-shaped relationship between Protestantism and GDP level. The level of GDP increases as the fraction of the Protestantism rises, but beyond some point,

it begins to fall. In a country where the Protestant religion is too dominant, the economic impact turns negative, which can be explained by the secularization model.

The split sample regressions report that Hindu and Muslim religions show negative effects on GDP level in high income countries. In low income countries, Buddhist, Hindu, and Muslim religions have positive effects, while Catholic and Protestant religions have negative effects. The effect of Buddhist and Hindu religions on GDP growth is positive in high income countries and negative in low income countries. Islam has a negative effect on GDP growth in high income countries only. Overall, the regression analysis shows a substantial contrast between Western religions and non-Western religions.

The empirical results suggest that the economic effect of religion differs between religions and the level of economic development. It implies that the economic effect of religion depends on the peculiar characteristics of each religion and the mediating role of the level of economic development.

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