

2015

## Does religion affect economic growth?

Parash Upreti  
*University of Northern Iowa*

*Let us know how access to this document benefits you*

Copyright © 2015 Parash Upreti

Follow this and additional works at: <https://scholarworks.uni.edu/hpt>



Part of the [Growth and Development Commons](#), and the [Religion Commons](#)

---

### Recommended Citation

Upreti, Parash, "Does religion affect economic growth?" (2015). *Honors Program Theses*. 186.  
<https://scholarworks.uni.edu/hpt/186>

This Open Access Honors Program Thesis is brought to you for free and open access by the Student Work at UNI ScholarWorks. It has been accepted for inclusion in Honors Program Theses by an authorized administrator of UNI ScholarWorks. For more information, please contact [scholarworks@uni.edu](mailto:scholarworks@uni.edu).

**Offensive Materials Statement:** Materials located in UNI ScholarWorks come from a broad range of sources and time periods. Some of these materials may contain offensive stereotypes, ideas, visuals, or language.

DOES RELIGION AFFECT ECONOMIC GROWTH?

A Thesis Submitted  
in Partial Fulfillment  
of the Requirements for the Designation  
University Honors

Parash Upreti  
University of Northern Iowa  
May 2015

This Study by: Parash Upreti

Entitled: Does Religion Affect Economic Growth

has been approved as meeting the thesis or project requirement for the Designation

University Honors

\_\_\_\_\_  
Date

\_\_\_\_\_  
Dr. Imam Alam, Honors Thesis Advisor

\_\_\_\_\_  
Date

\_\_\_\_\_  
Dr. Jessica Moon, Director, University Honors Program

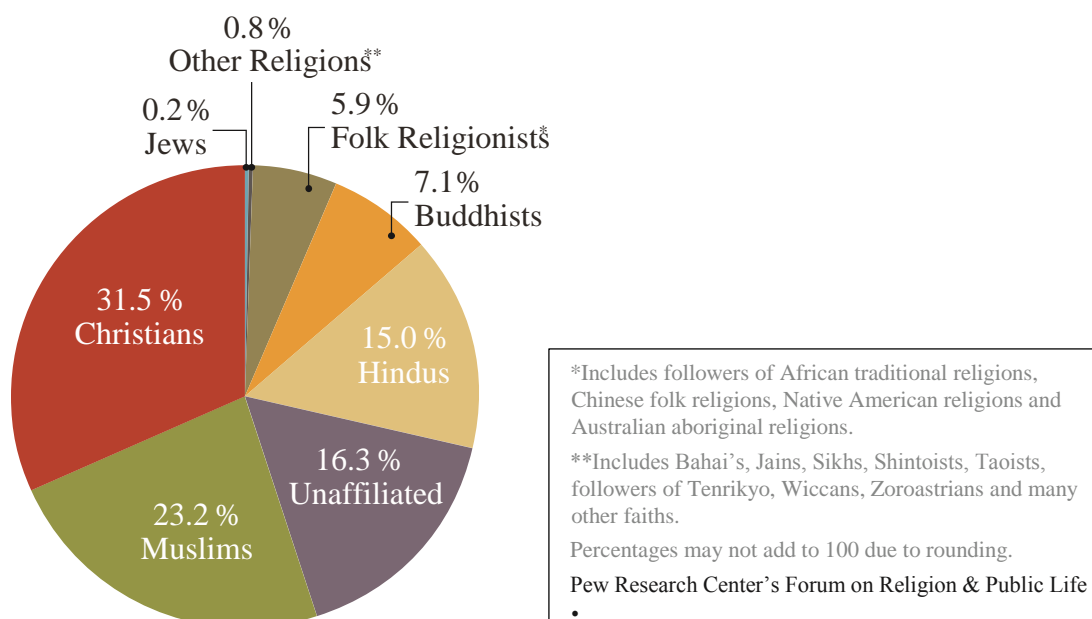
## Introduction

A majority of the people in the world are affiliated with a religion. A study about world's major religious groups found out that there are about 5.8 billion religiously affiliated people, which is about 85% of the world's population (Pew Research Center 2012). It is important for people to understand how religion affects people's daily lives, especially how religions affect spending and income. In this study, we are interested in finding whether or not religion has an impact on the economic growth of a country. Past studies have suggested that religion, in specific forms and activities, affects the people's income and standard of living. The Protestant ethics of hard work and capital accumulation are the oldest and the best-studied examples (Weber 1920). With the world's population moving between countries and thus changing the religious landscape, it is important to understand how each religious group affects the economy where they live. Previous studies that look into particular religious behaviors and beliefs, such as church attendance and belief in heaven and hell (Barro & McCleary 2003) and specific sects of Christianity (Grier 1997), suggest that religion may affect economic activities, ethics and thus the outcome.

In 2010, the world population was about 6.9 billion of which can be classified into Christians, Muslims, Religiously Unaffiliated, Hindus, Buddhists, Folk Religionist, Jews, and Other respectively with descending order of global population composition. Pie chart in Figure 1 shows the population distribution of the world according to different religious groups. Of these religious groups, only Hindus, Christians, Muslims and Religiously Unaffiliated people lived in countries where its adherents were a majority and all other religious groups lived as minority. For example, about 97% of all Hindus lived in India, Mauritius or Nepal where Hinduism was a majority religion. 72% of all Buddhists lived in countries where a different religious group was

majority such as China, which contained of 50% of world's Buddhist population but only made up 18% of the total population of China. It can be seen that some countries, such as Afghanistan and Ireland, were polarized by one religion and some others consisted of multiple religions (Pew Research Center 2012). In such scenarios, if religion has any impact on economic activity, studying economics by disentangling religious composition may yield results that have socio-cultural implications.

Figure1:



In this study, we divide the population of countries into percentage of religious composition. Then we add other indicators of economic growth. By using cross sectional multivariable linear regression to see if religion has an impact on the economic growth. Dependent variable is economic growth which is the per capita GDP growth rate. This study broadly looks at 125 countries of the world and compares their economic growth from 2001-

2010. This study is different compared to previous literature because it represents each religion as the percentage of the population adhering to it, which is used as a separate independent variable. Also, while previous empirical papers studied specific region of the world or a particular religion and their denominations, our study covers more countries and major religion. This study aims to establish if a particular religion has positive, negative or no effects on economic well-being of a country. While this project does not have a policy implication, it may provide results that could lead to further studies in the field of economics, sociology or anthropology.

### **Literature Review**

In the world-renowned *The Protestant Ethic and the Spirit of Capitalism*, Weber (1920) argued that religion was an indomitable aspect of the economic well-being of the society. He explained that some of the early protestant societies, in Puritan form, were doing better economically than other societies. The behavior and the work ethics, which initially were sparked by their religion, became part of social life and outlasted the feverish reformation period. According to Weber, John Wesley, the founder of Methodism and the Holiness Movement proposed the ideas to gain, save and give among his followers. Those followers of Wesley, through hard work and saving, improved their standard of living. Thus, religion has an important role in the economic behavior in people's life.

The study of the effects of religion on economic growth and development has been going on for hundreds of years. Iannaccone (1992) analyzed the works of Adam Smith, the father of modern economics, in *An Enquiry to the Nature and the Causes of Wealth of Nations*. He found Smith's strong argument in favor of disassociation between church and state emphasizing the importance of market structure and rational choices. According to Iannaccone, Smith argued that

the state-backed religious monopoly led to market inefficiency. Iannaccone also highlighted the importance of competitive religious markets where people could make choices based on rational discussion about religious beliefs. So, religion was a rational choice to maximize economic well-being.

In the paper *Economic Growth among Countries*, Barro and McCleary (2003) analyzed international survey data to study the relationship between church attendance, religious beliefs and economic growth in different countries. They found that attending church and religious activities reduced the rate of economic growth and argued that it might be true because those activities used up more time and resources with less economic output. On the other hand, they discovered that for a given number of weekly church attendance, an increase in religious beliefs had a positive effect on economic growth. Beliefs in hell, heaven, afterlife, etc. encouraged people to work harder. They also mentioned that fear of hell may have a bigger impact than other beliefs. This reflected the people's work ethic, honesty, thrift, and openness to strangers.

In another related paper Barro and McCleary (2006a) looked at the two way effect between religion and economic growth. First they looked at religion as a dependent variable. Their empirical evidence supported the theory that as income increased, people became less involved in religious activity. When religion was the independent variable, its effect on economic well-being was similar to work ethic and thriftiness. They also found further evidence that beliefs in heaven and hell were still significant factors in economic growth. McCleary (2008) further argued how two way causation, the interrelationship between economic growth and religion, was important to study. She compares the four primary indicators of economic developments: education, value of time, life expectancy, and urbanization with religion. The result for religiosity was correlated positively with education and negatively with life

expectancy, value of time and urbanization. She summarized by saying that major world religious beliefs promoted hard work, thrift and honesty, but the dilemma laid in the sociocultural values of how people perceive those beliefs.

Barro and McCleary (2006b) moved further to look at more diverse and specific variables in addition to church attendance and religious beliefs. They added communist and ex-communist countries as two new independent variables. Note that communists were known for their retaliation against religious beliefs. For example, the former USSR, the leading communist nation at that time and the first country to propagate atheism, suppressed religious activities and prosecuted people for expressing religious beliefs (Luukkanen 1994). They found out that religiosity declined because of the tight policies of the communist governments against religion. The fall of Soviet Union and other communist regimes in the 1990's led to a recovery of religiosity. They suggested that further research was needed to be conducted in this field by including organized religion, government regulations, subsidies and prohibitions.

Other studies also found that religion played a role in the economic growth of developed and developing countries. Using a sequential logit approach, Alam and Amin (2008) studied labor participation of women in rural and urban areas in Malaysia. They found that Muslim women had lower levels of labor force participation rates compared to women of other religions. They concluded that religion had a significant impact on unmarried women's decisions to work for pay in both rural and urban areas with higher significance for women from villages than from the cities. Likewise, by applying cross sectional and longitudinal data analysis techniques, Heineck (2004) found that women with strong convictions to faith tended to have fewer paid jobs. These studies showed that religious adherence has detrimental effect on participation in labor force and creating earning.



A study of 63 former colonies in Latin America found that former British colonies, who followed Protestant denominations of Christianity, were achieving higher economic growth than Spanish and French colonies, who adhered to Catholicism (Grier 1997). Grier empirically tested protestant work ethics (Weber 1920) and found that Protestantism was positively and significantly correlated with real GDP growth. Therefore, Protestantism was one of the many significant factors of growth and development in Latin America compared to Catholicism.

Besides religion, other widely used indicators of economic growth in econometric analysis are natural resources, availability of capital, government expenditures, public and private saving, foreign direct investment inflow, openness to trade, and education. Barro (1996) studied a panel of 100 countries from 1960 to 1990 to find the factors that affected the economic growth. He found that the growth rate of real per capita GDP is associated with maintenance of rule of law, smaller government consumption, longer life expectancy, more male secondary and higher level of schooling, lower fertility rates, higher level of investment, level of democracy, lower inflation, and openness in trade.

A country rich in natural resources can benefit from the production and sale of such wealth. So natural resources as a source of production or input can enrich a country's economy. However, with increase in natural resource production, there is an increase in rent seeking mentality, diversion of resources, and appreciation of domestic currency which affects growth in negative ways because of the natural resource trap (Collier 2007). Even with abundant natural resources such as oil and diamonds, countries in Africa have not experienced substantial growth (Sachs and Warner 1995).

Foreign Direct Investment (FDI) is a big source of external funding in developing and developed countries. Caves (1971) found that there is a positive correlation between the

productivity of a multinational enterprise and labor productivity. FDI benefits a host country through added employment, new technology, and transfer of knowledge.

International trade enhances the economies of both importing and exporting countries. Kavoussi (1984) found that higher rates of economic growth were strongly correlated with higher rates of export growth which held for both middle- and low-income countries. However the least developed countries were heavily dependent on primitive agriculture and more vulnerable to shocks as increase in prices of their export would reduce the demand and vice versa affecting the quantity exported.

In general, existing research in this field implied that there may be a positive effect of adhering to religion on economic well-being. Building off of it we tested this claim empirically using ordinary least square regression. Since the existing research has limitations on the variety of religions studied or the region covered we looked to answer how followers of religion as a percent of population impacts the per capita GDP growth rate by studying as many countries in the world for which data is available.

## **Data and Method**

Data were collected for the period between 2001- 2010 for 125 countries from various sources described below. The data were cross section for each year starting at 2001 and ending at 2010 for those 125 countries. Then the arithmetic mean of the ten years were taken for each variable of all observations. The indicator of economic growth rate was the annual growth of per capita GDP based on the constant 2005 Purchasing Power Parity (PPP) dollars. The data on GDP per capita growth rate, GDP per capita of 2001, natural resource rent, and gross secondary school enrollment rate were taken from the World Bank (2014). The data on demography of religion

was taken from the Global Religious Landscape (Pew Research Center 2012). Trade freedom index was taken from the Heritage Foundation (2014), and capital stock, government spending, Foreign Direct Investment, and saving data were taken from the Penn World Table (2013).

In order to control for the business cycle, the data were averaged for the given ten year period and given a cross sectional interpretation. Note that the words written in all caps, for example, GROWTH or NATURALRESOURCE, are proxies of their variable described in described in subsequent paragraphs. GROWTH, indicated by GDP per capita growth rate, was the dependent variable. Positive GROWTH was interpreted as economic growth and a negative GROWTH as the shrinking of the economy.

Similarly, in order to understand the effect of religion on economic growth, each religion was considered as the independent variable. There are varying definitions on the classification of religion. Broad classification of religion was taken. For example, instead of using Catholicism, Protestantism, Eastern Orthodoxy, etc. as separate variables, Christianity is used to limit the number of independent variables. The indicator variables of religion were CHRISTIANITY, ISLAM, HINDUISM and BUDDHISM. The total of these variables in each country did not add up to 100% because the category for unaffiliated and others religion was left out of this study. This was done in order to avoid the issue of singularity. This will be explained in later sections.

CHRISTIANITY, ISLAM, BUDDHISM and HINDUISM included all denominations and sects of each respective religion. Percentage of people who were unaffiliated or followers of other religion were left out. Unaffiliated represented the percent of people who identified as religiously unaffiliated to a particular religion with or without belief in god, atheist and agnostic. The countries that had a high proportion of unaffiliated individuals were communist or ex-communist countries. Some of the developed countries also had a considerable population of

unaffiliated individuals. Other religions included Judaism, a majority religion in Israel only, and other smaller religions which did not make religious majority in any country. Examples were Jainism, Sikhism, Baha'i, and folk religions.

Other control variables in this study were the variables that have been identified to have a positive or negative impact in the economic growth through the well-established theories in economics. INITIALGDP was the GDP per capita of 2001, the first year of the 10 years of this study. This variable was used to control for the different sizes of per capita GDP between countries. In other words, economies with lower GDP per capita tend to grow faster than the bigger ones. Introduction of this variable in the study controlled for such effect (Barro & Sala-i-Martin 1992). Hence, coefficient on INITIALGDP was expected to be negative.

Likewise, NATURALRESOURCE indicated the average annual amount of natural resources such as petroleum products, coal, minerals, etc. extracted by a country as a percent of GDP from 2001-2010. The extraction, use, and export of natural resources provided employment opportunities, development of infrastructure, and international trade which usually led to economic prosperity and thus suggested the variable to have a positive coefficient. But on the contrary, the empirical evidence suggested that was due to rent-seeking mentality, diversion of resources from other sectors into natural resource production, and appreciation of exchange rates to have negative impacts on the economy. So the expected coefficient of NATURALRESOURCE was unknown.

CAPITAL measured the average of annual total capital stock held by a country during 2001-2010. The unit of measurement was 2005 PPP dollars. Countries with higher amounts of capital stock were expected to grow faster compared to countries with lower capital stock, so the expected coefficient was positive.

GOV measured the average annual government expenditure as a percent of GDP during 2001-2010. With higher government expenditure on capital formation, better infrastructure could be developed which could lead to long-run growth. However high levels of government expenditure compared to its revenue might lead a country towards a default risk on its loan and even bankruptcy. For these reasons, the expected coefficient of GOV was positive.

FDI measured the average annual Foreign Direct Investment inflow into the country as a percent of GDP during 2001-2010. As the foreigners invested in a country, its potential to create jobs for its surplus labor increased which also increased national output. With additional investment, additional economic activities were carried out. So, the inflow of foreign investment helped boost the local economy. The expected coefficient of FDI was positive.

SAVINGS was an indicator of average annual saving rate as a percent of GDP during 2001-2010. Higher saving rates led to higher investment rates. For example, as people saved their money with financial institutions, the financial institutions invested the new accumulated wealth in productive sector such as power plants, building of factories, etc. Thus, increase in savings had a positive effect on economic growth. Therefore, the expected coefficient of SAVINGS was positive as well.

Likewise, EDU represented the average annual gross percentage of the population enrolled in secondary education, regardless of student's age, out of corresponding secondary education student's age group. Note that this percent might be above 100% because of non-traditional students and younger students in secondary schools. Additional schooling enhanced human capital and thus productivity. Therefore expected coefficient of EDU was positive.

OPEN used the Heritage Foundation's Trade Freedom Index to measure the openness of trade to the international economy. It ranged from zero to 100, zero indicating not open and 100 indicating very open for international trade. The rationale behind using this index instead of export/import to GDP ratio was because in addition to export or import quantities, this index also included trade policies, practices, and laws. Openness increased specialization and productivity, hence comparative advantage. So coefficient of OPEN was expected to be positive.

This dataset may be imperfect because of the different standards of data collection across countries. Therefore, similar data collected from different sources may not match. Some countries and territories may not be recognized in some data sources. Also, due to limitations on availability of data, some variables for some countries were missing in the sources used. In such scenarios, the whole observation was eliminated from this study. Some variables such as corruption could not be included in the study because the data was available only for a smaller sample of my observation. Also, other variable were excluded even though they might have an impact on this study due to contradicting results in existing literature and their limited scope. Though imperfect, these were the most standardized and widely used data sources. The results produced in this study were as reliable as possible.

Table 1 shows the descriptive statistics of the data that are used in the study. The first row shows the average GROWTH for the period 2001-2010. GROWTH has a mean of 3% and standard deviation of 2.5% for 125 observations. The Bahamas observed a negative economic growth of -1.2% annual average while Azerbaijan has an accelerating annual average growth rate of 14% between 2001 and 2010. Rows 2 to 5 show the religion variables that we are interested in looking at. The extreme minimum of 0% and maximum of up to 99.9% in religious composition explains the religious polarity in some countries. While most of the countries have only one or

two major religion(s), their distribution is highly skewed. In a similar way, Dominica's average Capital Stock was \$438 million 2005 PPP whereas USA's was more than \$37 trillion.

It is important to understand that the mean and standard deviation do not represent the world averages or variations since there are missing observations in the data set. However, they are close to the average for the available observations. The percent of population or percent of GDP should also not be misinterpreted since the size of population and size of GDP vary from country to country. For example, India has a population of more than 1.2 billion of which about 15% is Muslim which is about the same number as the entire population of Nigeria, the 7<sup>th</sup> most populous country. Similar arguments can be made about GDP. The use of these percentages however, provide us a measure to compare across countries.

It can be seen from the Table 2 below that the some countries in the world are very polarized by one religion. Of the four major religions in our analysis, each of them are overwhelming majority in at least one country represented by the maximum value of 80% and over. Also, the minimum value of 0% in all religions implies that not all are adhered by people of the country for our sample. Standard Deviation for Christianity and Islam are higher than for Hinduism and Buddhism because they are the religion that are well spread all around the world whereas Hinduism and Buddhism are not as well spread. Hinduism is concentrated in only three countries- Nepal, India, and Mauritius and Buddhism mainly in East and South-East Asia. These are just a few observations. More information could be generated from the descriptive statistics table.

Table 1: Descriptive statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
<i>GROWTH (% change)</i>	2.92	2.47	-1.23	13.95
<i>CHRISTIANITY (% of pop.)</i>	55.58	36.62	0	99.5
<i>ISLAM (% of pop.)</i>	23.86	35.46	0	99.9
<i>HINDUISM (% of pop.)</i>	2.84	11.77	0	80.6
<i>BUDDHISM (% of pop.)</i>	4.03	15.00	0	96.8
<i>INITIALGDP (2005 PPP \$)</i>	11407.76	12393.47	203.27	55523.02
<i>NATURALRESOURCE (% of GDP)</i>	8.87	13.61	0	65.65
<i>CAPITAL (2005 PPP \$ MIL)</i>	1370137	4438346	438.30	37470867
<i>GOV (% of GDP)</i>	0.18	0.08	0.05	0.57
<i>FDI (% of GDP)</i>	5.31	6.80	-4.65	64.31
<i>SAVINGS (% of GDP)</i>	20.32	10.02	-13.08	51.58
<i>EDU (% gross enrollment)</i>	76.93	29.87	10.09	139.57
<i>OPEN (1-100)</i>	69.45	12.68	26.94	91.5

## Model

Ordinary Least Squares (OLS) model was used to analyze the cross section data in this study to examine if religion had an impact on the economic growth of a country. The model included the religion variables as a percent of population following that religion in a country instead of a dummy binary variable for the majority religion. By doing so, we were able to



differentiate the country that had bigger variance in its religious composition. For example, we were able to differentiate between Romania, with 99.5% Christians, against the Netherlands, with 56% Christians, but both would have made majority in respective countries. If we were assigning dummy variables, we would assign value 1 for both countries and thus this important distinction would have been lost. Also, this method aided us in studying countries like Nigeria where 49.3 % were Christians and 48.8% were Muslims. As mentioned earlier, unaffiliated and other religions were excluded in order to avoid singularity. ‘Unaffiliated and other religions’ was eliminated instead of one of the four main religion- Christianity, Islam, Hinduism and Buddhism. It is because we are especially interested in these four religions. If all categories of religion were included then the total population would add up to 100%. The data on other religions were adulterated because of the combination of multiple religion with completely different characteristics together. This model is derived from a research by Barro (1996). We have modified this model by using newer data, adding religious composition as an independent variables, and using key control variables that had significant effect on per capita GDP growth rate of a country. For the statistical analysis of the econometric model or the regression “Gretl”, an econometric software was used. The data was run in the following regression equation which shows GROWTH as a function of religion variables and other economic variables well proven in previous reseach. The model is corrected for heteroskedasticity, which is done in order to prevent the unusual variance in the data affecting the linear model.

$$\begin{aligned}
 GROWTH = & \beta_0 + \beta_1 CHRISTIANITY + \beta_2 ISLAM + \beta_3 HINDUISM + \beta_4 BUDDHISM \\
 & + \beta_5 INITIALGDP + \beta_6 NATURALRESOURCE + \beta_7 CAPITAL + \beta_8 GOV \\
 & + \beta_9 FDI + B_{10} SAVINGS + \beta_{11} EDU + \beta_{12} OPEN + \varepsilon
 \end{aligned}$$

## Results and Interpretation

Table 2 shows the output of the regression.

Table 2: OLS, using 125 observations

Dependent variable: GROWTH

Heteroskedasticity-robust standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>p-value</i>
CONSTANT	-2.03	1.89	0.28
<i>CHRISTIANITY</i>	-0.01	0.01	0.40
<i>ISLAM</i>	-0.00	0.01	0.83
<i>HINDUISM</i>	-0.01	0.02	0.69
<i>BUDDHISM</i>	0.02	0.01	0.29
<i>INITIALGDP</i>	0.00***	0.00	0.01
<i>NATURALRESOURCE</i>	0.01	0.02	0.77
<i>CAPITAL</i>	0.00***	0.00	<0.001
<i>GOV</i>	3.23	2.58	0.21
<i>FDI</i>	0.09***	0.02	0.00
<i>SAVINGS</i>	0.04**	0.02	0.03
<i>EDU</i>	0.02**	0.01	0.02
<i>OPEN</i>	0.1***	0.03	0.00

R-squared	0.49	Adjusted R-squared	0.44
F(12, 112)	7.32	P-value(F)	9.06e-10

Note: \* denotes significance at 10%, \*\* at 5%, and \*\*\* at 1% levels

The first portion of Table 2 shows the regression output for individual variables we tested. The second portion of the table shows the overall fit of the model. The elements of first column are the name of the variables, second column shows the coefficient of the variable tested which is the magnitude of the effect on the dependent variable. The asterisks by the coefficient shows the significance level. \* means significant at 10% level p-value, \*\* means at 5%, and \*\*\* means at 1%. So 0.1\*\*\* coefficient of OPEN means that one unit increase in index of economic freedom increases the GDP per capita growth rate by 0.1%. Likewise 0.09\*\*\* coefficient of FDI means that one 1% increase in Foreign Direct Investment inflow over GDP increases GDP per capita growth by 0.09% as unit of GROWTH is % change. This interpretation is valid for all statistically significant coefficients. Standard error measures the spread of the data for each variable. P-value is the level at which we measure if the coefficient of variables are significant or not.

The average of the dependent variable GROWTH was 2.92% with a standard deviation of 2.47 as shown in table 1 above. Overall, there was a positive growth with the rates between the countries differed. The explanatory variables used in the model explained this phenomenon. The adjusted R-squared was 0.44 which means that the model explains about 44% of the reasons for per capita GDP growth rate (GROWTH). For a linear multivariable regression, this adjusted R-squared is a strong indicator of the model's accuracy. Some R-squared might have been reduced as a result of controlling for business cycle by averaging data over ten years. The p-value for the F-test was very close to zero which provided evidence that the model was robust.

Unfortunately, none of the coefficients of religious variables were found to be significant in this regression output. The p-value for all religion variables were very high. The interpretation of this analysis is that we do not have enough evidence to show that religion has any impact on

the economic growth of a country. While this did not verify our hypothesis, we cannot say that it contradicted results from the previous studies that were analyzed in the beginning of this project either. Also, two of the important control variables, NATURALRESOURCE and GOV, did not have significant coefficients which further means that we did not have statistical evidence to conclude that these factors have expected impacts on economic growth.

However, the coefficients of the remaining of the control variables turned out to be highly significant. Our variable for indicator for convergence INITIALGDP had a coefficient significant at 1% but the coefficient was almost 0. We had expected this coefficient to be negative as bigger economies grow slower. This result might suggest that convergence theory did not hold during 2001-2010. It could have been an effect of the global financial crisis of 2008-2009. The coefficient of CAPITAL was also significant at 1% and was also close to 0. These two variables imply that, though significant, they do not have much impact on economic growth.

Other control variables such as FDI, SAVINGS, OPEN, and EDU had positive coefficients which were highly significant (smaller than 5% level). Their regression outcome matched the predicted sign as well, verifying the economic theory. The significance of the coefficients of these variables can be summarized as follows. Economy receiving foreign direct investment can create more jobs within the country. Similarly, higher savings rate leads to better infrastructure. Likewise, openness in trade improves comparative advantage and additionally, high education enrollment rate results in better human capital, all of which required factor of economic growth.

After getting the above result, the data was run through the variance inflation factors (VIF) test to check for multicollinearity. Multicollinearity is an issue in regression when two or more independent variables are correlated. For example, in an analysis for football offensive

statistics, if passing yards, rushing yards, and yards gained are used in the analysis, then there will be multicollinearity in that test since passing and rushing yards combined is correlated with yards gained. The variance inflation factor (VIF) test runs an ordinary least square regression against all other independent variables similar to our model above. Table 3 shows the result of VIF test

Table 3: Variance Inflation Factor (VIF) Test

Minimum possible value = 1.0

Values > 10.0 may indicate a collinearity problem

Variable	VIF Score	Variable	VIF Score
Christianity	6.07	Capital	1.22
Islam	5.74	Gov	1.20
Hinduism	1.53	FDI	1.19
Buddhism	2.34	Savings	1.54
Initial GDP	2.51	Edu	2.42
Natural Resources	1.32	Open	2.01

As the VIF score for all independent variables were less than 10, we concluded that our model did not have multicollinearity issues. Although multicollinearity was not an issue in our data, future studies should do such tests to confirm that the dataset is not at risk. Hence, by correcting for heteroskedasticity and testing for multicollinearity for our data we were able to further assess the robustness of our dataset and the model.

## Conclusion

The purpose of this project was to empirically test if religion had any effects on economic growth of the country. By looking at the data for 125 countries between 2001 and 2010 we used ordinary least square regression to test our hypothesis that religion may have a positive impact on the economic growth. Our model was corrected for heteroskedasticity and tested for multicollinearity. The conclusion of our test was that we did not have enough statistical evidence to show that religion promoted economic growth. We also found out that theory of convergence that rich economies grow slow did not necessarily hold true since we did not get a negative coefficient. Similarly, we did not find a significant positive impact of higher capital stock on economic growth for this dataset. However, we were able to recertify that some of the factors of economic growth that have been widely studied in growth and developmental economics hold true. Savings rate, foreign direct investment, trade openness and human capital were significant driver of economic growth as their coefficients were positive and highly significant.

The significance of this study is the use of updated dataset in a very well established econometric model of growth. Also, studying religion and its impact on economic growth by using percent of people adhering to a religion could be extended by using sects and denominations wherever possible. It is an addition to the idea of assigning binary variable to classify countries to different religion. As mentioned before, this project does not have a policy implication as change in composition of population dynamics is a natural phenomenon. So, it opens a whole new discussion on how economics and religion could be studied in fields such as sociology and anthropology as well.

There were limitations with this study as there were limited number of countries available in our sample. For the available observations, there were missing data which further reduced the

sample size. There were also other missing variables in this study which if included would have provided a better empirical result. Future studies which include some missing variables will be able to explain the effects of the independent variables in this topic better.

The study of economic growth is extremely difficult as it a very dynamic process. Statistical analysis can only provide a limited answer to this process. In order to better study this process we plan to further this study by using panel analysis in the future as the ordinary least squares model may have limited capability and may not perform very well with all kind of data sets. Panel analysis and other sophisticated statistical models fix the limitations of ordinary least squares and provide better results. We also plan to further divide major religions into their sects and denominations and test Weber's claim that Protestant work ethics enrich the economy. We would also like to expand the data set used here as the missing data and observation may have altered the results. We hope that our conclusion that we did not have enough evidence that religion was a factor of economic growth, which does not align with previous studies that claim that religion improves economic growth, encourages further research in this field.

## References

- Alam, Imam. and Shahina Amin. 2008. Women's Employment Decision in Malaysia: Does Religion Matter? *Journal of Socio-Economics* 37, 2368-2379.
- Barro, Robert J., and Xavier Sala-i-Martin. 1992. Convergence. *Journal of Political Economy* 100(2): 223-251.
- Barro, Robert J., 1996 Determinants of Economic Growth: A Cross-Country Empirical Study. *National Bureau of Economic Research*, Working Paper: 5698.
- Barro, Robert J., and Rachel M. McCleary. 2003. Religion and Economic Growth Across Countries. *American Sociological Review* 68, 760-781.
- Barro, Robert J., and Rachel M. McCleary. 2006. Religion and Economy. *Journal of Economic Perspective* 20, 49-72.
- Barro, Robert J., and Rachel M. McCleary. 2006. Religion and Political Economy in an International Panel. *Journal for the Scientific Study of Religion*. 45(2), 149-175.
- Caves, Richard E. 1971. International Corporations: The Industrial Economics of Foreign Investment", *Economica* 38: 1-27.
- Collier, Paul. *The Bottom Billion: Why the Poorest Countries are Failing and What Can be Done About It*. New York: Oxford University Press, 2007.
- Grier, Robin. 1997. The Effect of Religion on Economic Development: A Cross National Study of 63 Former Colonies. *KYKLOS* 50, 47-62.
- Heineck, Guido. 2004. Does Religion Influence the Labor Supply of Married Women in Germany? *Journal of Socio-Economics* 33, 307-328.



- Iannaccone, Laurance R. 1991. "The Consequences of Religious Market Structure: Adam Smith and the Economics of Religion." *Rationality and Society* 3: 156-177
- Kavoussi, Rostam M. 1985. International Trade and Economic Development: The Experience of Developing Countries. *Journal of Developing Areas* 19: 379-392.
- Luukkanen, Arto. 1994. *The Party of Unbelief: The Religious Policy of the Bolshevik Party*. Studia Historica, Helsinki
- McCleary, Rachel M. 2008. Religion and Economic Development. *Policy Review* 148, 45-57
- Sachs, Jeffery D. and Andrew M. Warner. 1995. Natural Resource Abundance and Economic Growth. *National Bureau of Economic Research Working Paper Series*: 5398.
- Penn World Tables. 2014. Penn World Tables 8.0. <http://www.ggdcd.net/pwt> (accessed October 13, 2014)
- Pew Research Center. 2012. The Global Religious Landscape. <http://www.pewforum.org/global-religious-landscape.aspx> (accessed October 21, 2013)
- The Heritage Foundation. 2014. Index of Economic Freedom. <http://www.heritage.org/index/> (accessed November 20, 2014)
- The World Bank. 2014. Economic Indicators. <http://data.worldbank.org/> (accessed October 15, 2015)
- Weber, Max. 1920/2011. *The Protestant Ethic and the Spirit of Capitalism*. Translated by Stephen Kalberg. Oxford University Press: New York and Oxford.