The Strength of Belief: Empirical Research on the Influence of Religion on Economy—An Analysis Based on the Panel Data of Yangtze River Delta Region in China[*]

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In recent years, research on economic growth and development has paid more and more attention to the long-term influence of factors, like history and culture on productivity and national economy. It is very meaningful to study the role of religion in economic development as religion can affect value preference, human capital, and professional ethics. This paper uses the panel data of 25 cities in Yangtze River Delta region of China in 11 years (from 2004 to 2014) to study the influence of religious belief on economic growth. Research result shows that religion plays a positive role in promoting economic growth on the whole. In different religions, Christianity has a significant influence on economic growth. The conclusion is consistent in different regressions and has robustness. However, empirical research on other religions cannot come to a consistent and robust conclusion. Considering that China's research is rare in this field, this paper provides a new perspective as an exploratory research.

Keywords: religious belief, economic growth, Yangtze River Delta, panel data

Introduction

Religion has been playing an important role in human civilization and social development. However, the studies of scholars on economic development had been neglecting religion for a very long period of time, which was attributed to an old concept. Namely, religion had nothing to do with modern society and even limited or hindered social progress. Recently, trends like inseparability of religion and politics and importance of religion to human life and identity have again brought religion back to economic research. Just as Deneulin and Rakodi (2011) said,

> Religion is very important when people attempt to understand life and endow life with meanings. Religion is also one of main sources of values and moral outlook of most people in the world. Therefore, research on economic development should consider the dimension religion in human life and understand the relationship among religion, society and country. (p.45)

Some studies on economic growth and development have paid increasing attention to the long-term influence of geographical, historical, and cultural factors on productivity and per capita income. Existing studies find that religion actually plays a historic important role in the development and change of political and economic

system. Woodberry (2012) pointed it out that religion always had an effect on these new things in various aspects.

Under this background, the author is impelled to pay attention to the influence of religion on China's economic growth. This paper pays attention to two issues. In the first place, is there a correlation between religion and economic growth? In the second place, different religious groups have different ethical norms and doctrine principles and are thus supposed to show differences in affecting economic growth. Below are research contributions of this paper:

(1) Whereas there are few studies in this field in China, this paper is an exploratory research on the influence of religion on China's economic growth. The research of this paper provides new evidence for the correlation between religion and economic growth.

(2) It is a complicated work to infer the casual relationship between religion and economic growth. An important reason lies in the endogeneity of religion. Different from studies of Barro and McCleary (2003) and other scholars, we use municipal-level rather than state-level panel data to conduct an analysis in this paper, which is easier to control the cultural, economic, political, and institutional influence factors of different countries. In cross-national studies, some economic phenomena (such as inflation rate, trade policy, and judicial process) with differences in various countries may be ignored.

The reason why this paper chooses Yangtze River Delta region[1] as the research object is mainly that the region has been a strategic area of Chinese economy. With a solid foundation, developed science, education, and culture, and the relative balance of socio-economic development and historical and cultural traditions, this region is one of areas with the fastest development speed of Chinese economy, the optimal investment environment, and the best inherent quality of economy and social harmony and stability. On the other hand, both local religions and foreign religions in this region have obtained rapid spread and development and exerted a far-reaching influence on the society of Yangtze River Delta. Since reform and opening up, the development of religion in Yangtze River Delta region has presented a trend of steady growth in number of people and activity site. A large number of Buddhists, Christians, and Taoists gather in two provinces and one city including Jiangsu Province, Zhejiang Province, and Shanghai where many Muslim believers from northwest region also swarm. The number of Muslim living here for being engaged in industry or project, going into business and holding office keeps increasing. Religion and economy presents favorable development here. As a result, research on religion and economy in Yangtze River Delta region is of typical significance. Its research achievement is not only applicable to this region, but also has strong reference significance to study the relationship between religion and economy in China.

Below is the structure arrangement of this paper: Part Two is literature review. Part Three uses municipal-level panel data to empirically analyze the influence of religion on economic growth. Part Four is the conclusion of this paper.

Literature Review

Most of empirical studies show that religion is positively correlated with economic growth. Grier (1997)

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[1] There are 25 cities in Yangtze River Delta region (including Shanghai City, Jiangsu Province, and Zhejiang Province), including 13 prefecture-level cities in Jiangsu Province, namely Nanjing City, Wuxi City, Xuzhou City, Changzhou City, Suzhou City, Nantong City, Lianyungang City, Huai'an City, Yancheng City, Yangzhou City, Zhenjiang City, Taizhou City, and Suqian City, and 11 prefecture-level cities in Zhejiang Province, namely Hangzhou City, Ningbo City, Wenzhou City, Jiaxing City, Huzhou City, Shaoxing City, Jinhua City, Quzhou City, Zhoushan City, Taizhou City, and Lishui City.

used the data of Spanish, French (mainly Catholic countries) and British (Protestant countries) colonies to do research and found that religious difference was a factor affecting the economic growth of colonies. They also found that there was a significant positive correlation between the growth rates of Protestants and actual GDP. Based on the data of 59 countries in World Value Survey (WVS), Barro and McCleary (2003) found that economic growth was positively correlated with the degree of religion evolution and negatively correlated with the participation degree of churches, which meant that the relationship between religion and economic growth was up to whether an individual had religious belief subjectively rather than attend a church. Guiso, Sapienza, and Zingales (2013) used the data of 66 countries in WVS to do research. Results showed that active religious systems were beneficial to economic growth and improvement of per capita income level. Noland (2005) found that religious belief was related to economic performance. However, the robust coefficient structure of specific religion was not obtained through regression. Different from other studies, his research conclusion did not support the opinion that Islam was bad for economic growth. Wang and Lin (2014) used the data of provincial-level religious institutions in China to study the relationship between religion and economy and found that religion was conducive to the sustainable development of Chinese economy. However, it was a pity that they adopted the data of religious institutions in 2014 and supposed the number of religious institutions from 2004 to 2011 remained the same. In reality, we can observe that the number has been increasing from experience and statistical data.

Some studies also provide negative evidences. For instance, Durlauf, Kourtellos, and Tan (2012) used Bayesian model averaging (BMA) to study the robustness of conclusion of Barro and McCleary (2003). They found that the conclusion was not robust after the change of benchmark model equation. Eum (2011) used the updated data and found that the significant correlation between economic growth and religious activities or beliefs might not keep consistent in different periods. The influence of religious split and polarization had no statistical significance.

Empirical Research

In this part, we use the panel data of 25 cities in Yangtze River Delta region in 11 years (from 2004 to 2014) to conduct a quantitative analysis.

Model and Data

We build the following extended Cobb-Douglas Model:

$$Y = A \exp(\alpha_1 \ln(Religion) + \gamma_1 \ln(Edu)) K^{\beta_1} L^{\beta_2} Q^{\beta_3} \tag{1}$$

Wherein, Y stands for economic output; A refers to efficiency coefficient and factors measuring technological progress. To avoid the deviation of result caused by neglecting variables, we add as many control variables as possible to isolate the separate influence of religion from mixed factors based on theoretical and empirical research. Control variables include K (physical capital), L (labor), Q (knowledge capital), and Edu (human capital). $Religion$ represents religion we are concerned about.

Below is the panel econometric model corresponding to Function (1):

$$\ln(Y_{it}) = \ln(A) + \alpha_1 \ln(Religion)_{it} + \gamma_1 \ln(Edu)_{it} + \beta_1 \ln(K_{it})$$
$$+ \beta_2 \ln(L_{it}) + \beta_3 \ln(Q_{it}) + u_i + v_{it} \tag{2}$$

We explain every variable in detail as follows. Religion is usually not considered by development economics. Apart from the reasons, we have discussed before, another reason is that it is difficult to be quantified. Some studies make measurement by using the monthly participation rate of religious activities, dummy variables of believing in hell or heaven, the composition of religion in society, or the population proportion of various religions. In China, the provincial-level or city-level data of these variables is not obtainable. At present, China is still lacking in systematic and consistent microscopic investigation on religion. Therefore, we use the number of religious activity sites as religious variables as religious data are unobtainable. In China, most of religious activities are organized by religious activity sites. Therefore, the larger number of religious activity sites means the wider influence of religion on social life. Religious activity site exists objectively. As a result, it can measure religious belief more accurately than the number of believers as a statistical indicator. Due to the particularity of religion in China, the number of believers is usually underestimated. Data of this paper comes from China Data Center of University of Michigan, Basic Information Base of Religious Activity Places of Chinese Bureau of Religious Affairs, Information Base of Religious Sites of Jiangsu Bureau of Religious Affairs, website of Shanghai nationality and religion, statistical yearbook of various provinces and cities including Shanghai City, Jiangsu Province, and Zhejiang Province over the years and National Survey Research Center at Renmin University of China (NSRC).

Y stands for regional GDP (unit: 100 million yuan); K refers to the investment of fixed assets in various cities (unit: 100 million yuan); L is the number of staff in various cities (unit: 10,000 staff). We choose the number of patents to measure knowledge output Q. In the meanwhile, we refer to the method of Wang Xiaolu and Fan Gang (2004) to calculate Edu (human capital) so as to measure the influence of education on economic development. The definition of variables and statistical description is shown in Table 1.

Table 1

Definition and Description of Main Variables

Symbol	Variables	Definition of variables (description)	Mean value	Standard deviation	Minimum	Maximum
Y	*GDP*	GDP of various cities	3,115.33	3,490.35	212.04	23,567.00
K	Physical capital	Investment of fixed assets in various cities	1,431.54	1,324.26	88.57	6,054.00
L	Labor input	The number of staff in various cities	356.63	202.34	55.72	1,368.00
Q	Knowledge capital	The annual number of patent authorization in various cities	9,775.35	14,546.51	56.00	98,430.00
Edu	Human capital	The average age of receiving education in various cities	9.76	0.87	8.51	13.09
Religion	Religious belief	Total religious activity sites	507.97	825.03	25.00	4,757.00
Buddhism	Buddhism	Buddhism activity site	169.08	276.30	3.00	1,437.00
Christianity	Christianity	Christianity activity site	260.75	355.69	2.00	2,289.00
Taoism	Taoism	Taoism activity site	75.71	240.38	0.00	1,325.00
Islam	Islam	Islam activity site	2.38	2.52	0.00	12.00

The research hypotheses of this paper are proposed based on literature review and a preliminary analysis on correlation:

H1: Religion is one of driving factors promoting economic development on the whole, but its promoting intensity is not as obvious as that of education, capital and other factors.

H2: Different religions show differences in influencing economic development, among which Christianity

is the most active and stable.

To verify the above hypotheses, the author adopts the method of model estimation to conduct an analysis.

Model Estimation

We firstly adopt random effect (RE) and fixed effect (FE) to estimate Model (2). Columns (2) and (3) in Table 2 display the regression result. Due to the null hypothesis of *Hausman* that verification result is *p* = 0.0009 and unobserved effect (individual effect) refuses to have nothing to do with explanatory variables at the significant level of 1%, we adopt fixed effect model for regression. See Column (3) in Table 2 for the regression result of fixed effect model. In consideration of the deviation of regression result caused by the possible correlation between heteroscedasticity and sequence in panel data regression, this paper further uses feasible generalized least squares (FGLS) for another regression. See Column (4) in Table 2 for the specific regression result.

Table 2

Report on the Regression Result of Model (2)

LnGDP	Random effect model (RE)	Fixed effect model (FE)	Feasible generalized least squares (FGLS)
(1)	(2)	(3)	(4)
LnK	0.4104^{***}	0.3321^{***}	0.4469^{***}
LnL	0.4009^{***}	0.05961	0.04811^{***}
LnQ	0.1743^{***}	0.1883^{***}	0.17798^{***}
LnEdu	0.7123^{**}	0.5089^{*}	0.88362^{***}
LnReligion	-0.0536^{*}	0.1225^{*}	0.0667^{***}
Constant	-0.5922	1.6002^{*}	-1.3042^{***}
N	275	275	275
Hausman	$\chi^2 = 20.82^{***}$		

Notes. *, **, and *** represent significance at the level of 10%, 5%, and 1% respectively.

From Columns (3) and (4) in Table 2, the estimated result of FE is similar to that of GFLS. Except for the coefficient of variable *LnReligion*, we are concerned about most in models; the coefficient symbol of other variables is in line with expectations. In two estimation methods, *LnReligion* has significant positive effect of 0.01 level, which means that religion plays a positive role in promoting economic growth. However, its coefficient is smaller than that of *LnK* (capital), *LnQ* (knowledge capital), and *LnEdu* (human capital), which means that the intensity of religion promoting economic development in the region is not as obvious as that of the above factors. This empirical result verifies the first research hypothesis (H1) of this paper: Religion is one of driving factors promoting economic development on the whole, but its promoting intensity is not as obvious as that of education, capital, and other factors.

To further make clear the correlation between religion and economic development, this paper will make estimation by religion, hope to further refine and clarify the above regression conclusion in the aspect of structure and verify whether H2 is true.

Estimation by Religion

Different religious doctrines have significant differences in advocating or restricting some specific behaviors of people. Therefore, the influence of religion on economic development may vary from religious sect to religious sect. Then, we study the influence of different religious beliefs on economic growth. We use four variables to represent Buddhism, Christianity, Taoism, and Islam.

Model (2) changes into the following form:

$$\ln(Y_{it}) = \ln(A) + \alpha_1 \ln(Buddhism)_{it} + \alpha_2 \ln\ln(Christianity)_{it} + \alpha_3 (Taoism)_{it}$$
$$+ \alpha_4 \ln(Islam)_{it} + \gamma_1 \ln(Edu)_{it} + \beta_1 \ln(K_{it}) + \beta_2 \ln(L_{it}) + \beta_3 \ln(Q_{it}) + u_i + v_{it}$$

(3)

We adopt the above regression methods including RE, FE, and GFLS to estimate Model (3). Table 3 shows the estimated result.

Table 3

Report on the Regression Result of Model (3)

lnGDP	RE	FE	FGLS
(1)	(2)	(3)	(4)
lnK	0.462797***	0.2428313***	0.5264986***
lnL	0.4530284***	0.0512121	0.5383754***
lnQ	0.111247***	0.0999556**	0.0903884**
lnEdu	0.8708077**	0.9153315	0.5338885**
lnBuddhism	0.0685663	0.298795*	0.040548
lnChristianity	-0.0867767**	0.4747037***	0.1229333***
lnTaoism	0.0235722	-0.1229929	0.0366443*
lnIslam	0.0449955	-0.3262692***	-0.0546672*
_cons	-0.98101	-0.1762331	-0.7259648
N	186	186	186
Hausman	$\chi^2 = 40.54$***		

Notes. *, **, and *** represent significance at the level of 10%, 5%, and 1% respectively.

Table 3 displays the regression result and lists the random effect result to make a comparison. Due to the null hypothesis of *Hausman* that *p*-value tends to be 0 and unobserved effect (individual effect) refuses to have nothing to do with explanatory variables at the significant level of 1%, we adopt fixed effect model for regression. In consideration of the deviation of regression result caused by the possible correlation between heteroscedasticity and sequence in panel data regression, we further use feasible generalized least squares (FGLS) for another regression. From Columns (3) and (4) in Table 3, we can come to the following conclusion.

Not all religions have a positive effect on economic development and possess robustness in the result of influencing economic development. However, we can affirm that Christianity is the most robust among four religions. Two regression results are consistent. All models obtain the same coefficient symbol and the maximum coefficient value and the significance level maintains at 1%. The estimated result of FE and FGLS shows that the variable *lnChristianity* has a significant positive influence on economic growth. The empirical result also verifies the second hypothesis (H2) of this paper: Different religions show differences in influencing economic development, among which Christianity is the most active and stable.

Conclusion

As complex objective existence, religion is an informal institutional factor and also a part of social and cultural capital. No matter how we classify religion, it has a significant influence on the subjective and objective worlds.

This paper uses panel data and adopts regression estimations including fixed effect and feasible generalized least squares to verify research hypothesis one (H1) and two (H2). Results show that the two

hypotheses are true in Yangtze River Delta region in China. Firstly, religion has a positive influence on economic growth on the whole, which is consistent with most empirical research conclusions, which means that religion is one of driving forces promoting the economic effect of the region. Secondly, Christianity has the most significant influence on economic growth among different religious beliefs. In addition, the conclusion is reliable and robust. However, the estimated result of other religions is not so significant or robust and different estimation methods obtain different coefficient symbols or significance levels.

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