ABSTRACT

Religion and Economic Growth: An Analysis at the City Level Ran Duan, M.S.Eco.

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This paper looks at the effect of religious beliefs on economic growth using a Brazilian city-level survey data as opposed to the more popular country-level data, thus separating the effect from different social and historical context. The hypothesis is that certain religious beliefs stimulate people's positive behaviors and hence increase productivity. We also find that religious pluralism is positively correlated with economic growth. Religion and Economic Growth: An Analysis at the City Level

by

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A Thesis

Department of Economics

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Submitted to the Graduate Faculty of Baylor University in Partial Fulfillment of the Requirements for the Degree of

Masters of Science in Economics

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Accepted by the Graduate School May 2016

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ACKNOWLEDGMENTS

I received help from many Baylor faculty members, and I gratefully acknowledge their contribution.

I have greatly benefited from the comments from Chuck North.

I thank the statistical office that provided the underlying data making this research possible: Institute of Geography and Statistics, Brazil.

Finally, I thank Lourenço S. Paz for sharing his pearls of wisdom.

DEDICATION

To Baylor, the university that offered me a great opportunity

CHAPTER ONE

Introduction

The "Ancient" Question

Ever since the seminal work of Max Weber (1905), examines the relationships between the work ethics rooted in Protestantism and the spirit of capitalism, there has been a huge debate over the relationships between religious belief and economic growth. Does religious belief have a positive or negative effect on economic growth? If there is a strong relationship between religious belief and income, what is the direction of causality? Do religious belief and behavior even have an effect on economic growth?

The status of religious freedom varies country by country and even state by state, thus it is important to understand the relationships between religious behavior and income. This paper looks at the effects of religious beliefs on economic growth using a Brazilian city-level survey data. The hypothesis is that religious beliefs stimulate people's positive behaviors and hence increase productivities. We also find that the diversity of religion is positively correlated with economic growth.

The survey by Iannaccone (1998) separates studies of religion and economics primarily of interest to economists into two lines: research into economic interpretation of religious behavior and research into economic consequences of religion. Our study falls into the later. One of the most notable studies in this line is the seminal work of Max Weber (1905), which was the first to identify religious belief as an important force driving the emergence of modern capitalism. A century later, Barro and McCleary (2003)

and Noland (2005) demonstrate the positive effect of church attendance and religious belief on economic growth using country-level data. Such analysis, however, as Guiso, Sapienza, and Zingales (2003) argue, cannot separate the effect from different social and historical context. To handle this issue in our study, we resort to a city-level data set. Another advantage of using within country analysis in economics growth studies, point out by Higgins, Levy, and Young (2006), is that there are no exchange rate and price variations. In a recent paper, Bettendorf and Dijkgraaf (2010) point out the potential limitation of country study, suggesting that the effect of religious behavior on income might not be homogeneous in different countries.

The remainder of this paper is organized as follows. Chapter Two provides a brief literature review and situates this paper's contributions in it. The empirical methodology is described in chapter Three. Chapter Four details the results, and finally chapter Five provides the discussion.

CHAPTER TWO

Literature Review

The seminal work in this area is Max Weber (1905). It examines the relationships between the work ethics rooted in Protestantism and the spirit of capitalism and was the first to identify religious belief as an important force driving the emergence of modern capitalism.

Nearly a century later, scholars continue to investigate Weber's hypothesis. Barro and McCleary (2003) show the effects of church attendance and religious beliefs on economic growth. They argue that church attendance is an input to the religious sector and reduces input to the economic sector, thus imposing negative effects on economic growth. On the other hand, religious beliefs promote good work ethics and noble behaviors among people and, as a result, increase economic growth.

Noland (2005) investigated the hypothesis by conducting both a cross-country analysis and within-country analysis specifically in India, Malaysia, and Ghana. In a cross-country regression where per capita growth rates are the dependent variable, Noland (2005) shows that the Jewish, Catholic, and Protestant population shares are negatively correlated with per capita income. This result differs from that of Barro and McCleary (2003) and, to some extent, contradicts Weber (1905). He concludes, without pointing to a definite direction of the effects, that there are enough evidence both from cross-country and within-country studies to believe that religious belief affect economic growth.

Bettendorf and Dijkgraaf (2008) estimated the effects of religious behavior on income using a micro-dataset from the Netherlands. Using religious membership and participation as a measurement for religious behavior, they concludes that religion have no effect on income in the Netherlands. Our study using Brazilian city-level data helps answer this question: does the effect of religious belief and behavior on income differ from country to country?

In a more recent paper, Bettendorf and Dijkgraaf (2010) tested whether the effects of religious behavior are homogeneous in different countries. They pooled data from 25 countries from the World Values Survey. They conclude that the effects are not homogeneous and differ in countries with different income level. In high-income countries, they point out, church membership has a positive effect on income. On the contrary, in low-income countries, church membership has a negative effect on income. Guiso, Sapienza, and Zingales (2003) use micro-dataset for 66 countries obtained from WorldValues Surveys and controlled for country-fixed effects in their study on the relationship between intensity of religious belief and economic attitudes. They showed that religion and culture are economically important to the society.

In summary, after a century since Max Weber published his seminal work, "The Protestant Ethic and the Spirit of Capitalism," the debate on relationships between religious belief and economic growth is far from settled.

CHAPTER THREE

Empirical Methodology

To empirically test the hypothesis, we merged survey data provided by Institute of Geography and Statistics, Brazil, population information from Integrated Public Use Microdata Series (IPUMS) USA, census microdata for social and economic research, and measures of religious pluralism. The combined dataset contains 18,167 observations and spans three time points in which years the census are conducted, namely, 1991, 2000, and 2010, at city-level. We compute the growth rate as the difference of the logarithms of per capita GDP between 1991 and 2000 and between 2000 and 2010, respectively. It is nine years between 1991 and 2000 so we divided the differences of logarithms by nine to get a proxy for the annual growth rate. We did the same for 2000 to 2010 period. After obtaining the variable of our interest, we use the following empirical framework for cross-section estimate with Ordinary Least Squares:

 $gdppc_{t} - gdppc_{t-10} = \alpha_{t} + \beta gdppc_{t-10} + \delta relshares_{t-10} + \gamma relplural_{t-10} + \mu controls_{t-10} + u_{t}$

where gdppc is the natural logarithm of the per capita GDP. The 9 year or 10 year differences will be calculated using differences between observations in 1991, 2000, and 2010, respectively. Relshares is a vector of variables containing the share of population in the following religions (Protestant, Evangelical, Jewish, Spiritism, Afro-American religions, Asian religion, Atheist, and other). Note that the share of Catholics is omitted

because it is the base category. The result should thus be interpreted as the effect of certain religious share comparing to the effect of Catholics.

In the regressions where the growth rate is the dependent variable, we control for covariates such as elderly rate, Gini index, illiteracy rate, education index, urban population, Theil index, life expectancy, male population, and etc. To demonstrate the consistent effect, we used the following nine covariate sets for each regression, cross section for 1991 and for 2000 and instrumental-variables regressions for 1991 and for 2000 and instrumental-variables regressions for 1991 and for 2000: (1) none; (2) state indicators; (3) state indicators and share urban population; (4) state indicators and Pop share over 65, population share under 15, Gini index, and illiteracy rate; (5) state indicators, population share over 65, population share under 15, Theil index, and illiteracy rate; (6) state indicators, Gini index, illiteracy rate, and life expectancy; (7) state indicators, urban population share, and life expectancy; (8) state indicators, share urban population, and male population; (9) state indicators, Gini index, illiteracy rate, life expectancy, and male population. The equations in the tables 1 to 11 are labeled with number consistent with the covariate sets.

We first estimated cross section for 1991 and for 2000 using Ordinary Least Squares. With nine set of covariates this yields eighteen equations. After controlling for the economics related covariates, the coefficients of different religion shares and religious pluralism should reveal the effects they impose on growth rates.

Because religion shares are likely to be endogenous (North et al (2013)), we also estimated instrumental-variables regressions. The following instrumental variables are used: earlier religious shares and earlier religion pluralism measures. Instruments for endogenous religion variables are their values in 1980. North et al (2013) point out that

earlier data on religion have stronger predictive power on growth. The instrumentalvariables regressions estimate cross section for 1991 and for 2000 using relshares and relplural for 1980 as instruments for relshares and relplural.

Barro and McCleary (2003) use the method of seemingly unrelated regression (SUR), which estimates both the coefficients and the correlations of the error terms in the equations in different time periods, because observations at different points in time or from different survey sources are not independent. We use the same framework and estimated SUR at two time points, 1991 and 2000.

CHAPTER FOUR

Results

Economic Growth and Significance of Control Variables

Table 1 and table 2 provide a condensed summary of regressions on growth rate in 1991. The control variables show some economic insights in growth. The control groups have strong explanatory power. After adding a carefully selected control groups, the R-squared increased from 0.067 to 0.325 in equation (1) through equation (9).

The Gini index or Gini coefficient measures the dispersion in individual income. This measure is positively correlated with growth, confirming the theory that as people become richer, the dispersion in income became larger and larger. Tables 1 to 12 present consistent and statistically significant results of the negative relationship between growth and illiteracy rate. As shown by consistent negative coefficients and p-values that are smaller than 1 percent. On the contrary, Education is positively related to growth and the relationship is made clear by all statistically significant results shown in regression presented in table 1 to 12. Also, it is not surprising that urban population is positively correlated with per capita income growth rate. Life expectancy has a positive coefficient of 0.00112 and 0.00137 with standard error of 0.000218 and 0.000215, respectively, showing significant positive correlation between life expectancy and economic growth. Last but not least, as shown in table 7 and table 8, elderly rate is inversely related to growth. This can be explained by that elderly people retire and contribute less to the economy.

Economic Growth and Protestant

Encompassing more than 40% of Christian worldwide, Protestant is a major religion that has power big enough to impact economic growth. In his book, "The Protestant Ethic and the Spirit of Capitalism," Max Weber wrote that in Northern Europe, Protestant ethics galvanized a large number of people to work in the secular world, driving the emergence of modern capitalism.

The spirit of capitalism, according to Max Weber, is hard-working and making progress. This spirit coincides with Protestant's view of work, e.g. hard-work in any profession is blessed by God. The devotion from workers with the Protestant ethics drives the economic growth. Comparing with Catholics, the Protestantism focuses more on ethics recognizing that works are important and encouraging people to pursuit personal interests, or economic gains. Max Weber argues that "societies having more Protestants are those that have a more developed capitalist economy." Our findings show positive effect of Protestantism on economic growth and are consistent with Weber (1905). In table 1 and table 2, the coefficients for Protestant share are all positive from equation (1) to equation (9). In equation (1), the coefficient is 0.0419 is significant with standard error of 0.00106. The results are significantly positive in equation (7) and equation (8), as shown by the t-statistics 1.81 and 1.97, respectively. For the relationship in 2000, in table 3 to table 4, we also see all positive coefficients for Protestant.

	(1)	(2)	(3)	(4)
Variables	Growth	Growth	Growth	Growth
	0.0055044	0.0105444	0.0100555	0.0000
Log of per capita GDP	-0.00558***	-0.0137***	-0.0138***	-0.0322***
~ .	(0.0011)	(0.0015)	(0.0015)	(0.0024)
Protestant share	0.0419***	0.0141	0.0141	0.0105
	(0.0107)	(0.0107)	(0.0107)	(0.0104)
Evangelical share	0.0157	0.0062	0.0061	0.0083
	(0.0124)	(0.0135)	(0.0135)	(0.0134)
Jewish share	-1.508	-0.0294	-0.251	0.935
	(1.302)	(1.191)	(1.291)	(1.147)
Spiritism share	0.184***	0.162***	0.162***	0.0945*
	(0.0524)	(0.0501)	(0.0501)	(0.0497)
Afrorel share	0.0473	-0.166	-0.170	-0.214*
	(0.116)	(0.116)	(0.117)	(0.112)
Asianrel share	-0.339**	-0.00171	-0.00402	-0.0888
	(0.147)	(0.144)	(0.144)	(0.140)
Atheist share	0.0296*	0.0178	0.0177	0.0220
	(0.0158)	(0.0170)	(0.0170)	(0.0165)
Other share	-0.298***	-0.130*	-0.131*	-0.136**
	(0.0700)	(0.0673)	(0.0674)	(0.0650)
Inverse religion pluralism	(0)*	-0.0002***	(0)***	-0.0001**
	(0)	(0)	(0)	(0)
Elderly rate				0.0006
5				(0.0004)
Gini index				0.00174
				(0.00174)
Illiteracy rate				0.0000)
interacy rate				-0.0000 ****
Education index				(U) 0.0514***
Education muex				0.0514***
				(0.0123)
Urban population			7.06e-10	
			(1.58e-09)	
Constant	0.0658***	0.127***	0.128***	0.232***
	(0.00561)	(0.00952)	(0.00966)	(0.0139)
State Indicators	No	Yes	Yes	Yes
Observations	1.454	1.454	1.454	1.454
R-squared	0.067	0 249	0 249	0 313

Table 1. Growth Regressions 1991 part I

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

	(5)	(6)	(7)	(8)	(9)
Variables	Growth	Growth	Growth	Growth	Growth
	0.0215***	0.0252***	0.0212***	0.0070***	0.0250***
Log of per capita GDP	-0.0315***	-0.0352***	-0.0313***	-0.02/8***	-0.0352***
Destant of the	(0.0024)	(0.0023)	(0.0022)	(0.0021)	(0.0023)
Protestant share	0.00995	0.0118	0.0181*	0.0205**	0.0118
F 1. 1 1	(0.0104)	(0.0102)	(0.0103)	(0.0104)	(0.0102)
Evangelical share	0.00879	0.00153	0.00602	0.0108	0.00148
.	(0.0133)	(0.0129)	(0.0130)	(0.0132)	(0.0129)
Jewish share	0.953	0.948	0.259	0.215	0.852
	(1.147)	(1.137)	(1.239)	(1.258)	(1.230)
Spiritism share	0.0939*	0.0931*	0.0664	0.0722	0.0931*
	(0.0497)	(0.0488)	(0.0491)	(0.0498)	(0.0488)
Afrorel share	-0.217*	-0.183*	-0.171	-0.202*	-0.184*
	(0.112)	(0.111)	(0.112)	(0.114)	(0.111)
Asianrel share	-0.0792	-0.0731	-0.118	-0.166	-0.0739
	(0.140)	(0.139)	(0.140)	(0.141)	(0.139)
Atheist share	0.0218	0.0277*	0.0329**	0.0239	0.0277*
	(0.0165)	(0.0163)	(0.0164)	(0.0166)	(0.0163)
Other share	-0.140**	-0.141**	-0.128**	-0.128*	-0.141**
	(0.0651)	(0.0641)	(0.0646)	(0.0655)	(0.0641)
Inv religion pluralism	-0.0001**	-0.0001**	-0.0002***	-0.0002***	-0.0001**
	(0)	(0)	(0)	(0)	(0)
Elderly rate	0.000640				
	(0.000435)				
Gini index		0.006			0.0061
		(0.0078)			(0.0078)
Illiteracy rate	-0.0006***	-0.0005***			-0.0005***
	(0)	(0)			(0)
Education index	0.0502***	0.0527***	0 081/1***	0 0030***	0.0526***
Education mach	(0.0123)	(0.0527)	(0.0114)	(0.0103)	(0.0115)
Urban population	(0.0123)	(0.0115)	(0.0104)	(0.0105)	(0.0113)
orban population			0	0	
Theil index	-0.0033		(0)	(0)	
Then maex	(0.0037)				
Life expectancy	(0.0037)	0.00112***	0.00137***		0.00112***
Life expectation		(0.0002)	(0.0013)		(0.0002)
Male nonulation		(0.0002)	(0.0002)	(0)	(0.0002)
maie population				(0)	(D)
Constant	0 231***	0 174***	0 125***	0100***	0 174***
Collisiant	(0.0120)	$(0.1/4)^{-10}$	$(0.123)^{-++}$	(0.0116)	(0.0190)
State Indianters	(0.0159) V	(0.0180) V	(0.0133)	(0.0110) V	(0.0160)
State Indicators	1 es	1 es	1 es	1 es	Y es
Observations	1,454	1,454	1,454	1,454	1,454
K-squared	0.314	0.325	0.310	0.291	0.325

TABLE 2. Growth	Regressions	1991	part II
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Economic Growth and Spiritism

Another religion that we observe with consistent positive relationship with economic growth is Spiritism. Spiritism has influenced Brazil by driving a movement of building charity institutions and hospitals, benefiting millions of people. We find strong evidence to support the benefits of this spiritualistic doctrine. It is obvious in table 1 that the relationship between Spiritism and growth is very strong and positive. Equation (1), (2), and (3) in table on shows the coefficients of Spiritism share are 0.184, 0.162, and 0.162, with standard errors being 0.0524, 0.0501, and 0.0501, respectively. The tstatistics 3.51, 3.23, and 3.23 after we included two exhaustive control groups in equation (2) and equation (3) shows the strong evidence. The results are not only true for relationship in 1991, but also true for relationship in 2000. We can see from table 3 that the coefficients for Spiritism share are all positive with different set of controls, indicating a consistent relationship. We noticed that after introducing a different set of controls in equation (4), however, the t-statistics decreased to 1.73, as compared with 3.30 in equation (3). This is because Spiritism share is correlated with elderly rate, illiteracy rate, and education index.

Economic Growth and Atheist

Higher Atheist share is associated with higher growth, as evidenced by the positive coefficients of Atheist share in table 1 and table 2. Max Weber argues that the lower class, the poor, tends to cling to deep religious belief as a way to comfort themselves and provide hope for a better future. This support the fact that in cities where more people do not believe in God, the growth rates are higher. The only inconsistency

exist in table 3, where the coefficients for Atheist share in equation (1), (2), and (3) are -0.00134, -0.00994, and -0.00989, with standard errors 0.0089, 0.00964, and 0.00961, respectively. These coefficients are not significantly different from zero. In addition, because the Catholic is the omitted category, the interpretation for these coefficients is the relative effect of Atheist share on growth rate comparing with Catholic share. In the year 2000 regressions listed in table 3 and table 4, Evangelical share, Afrorel share, Asianrel share, and other share all have negative coefficients. When almost all religious share have a negative coefficients, it is possible that Catholic share have a strong positive relationship with growth rate. Therefore, the inconsistent regression coefficients of Atheist share in table 3 and table 4 do not disprove the fact that a larger share of population who do not believe in God is associated with a higher growth in income.

Economic Growth and Religious Pluralism

The evidence that religious pluralism is associated with higher growth rate is presented in table 1 and table 2. Equation (1) is a cross-section in 1991 without the economic indicators or state indicators. The t-statistics of coefficient for inverse religion pluralism is negative 1.68. After adding different control group, the results became more significant. Equation (2) through equation (9) shows cross-section in 1991 with eight different control groups. The coefficients for inverse religion pluralism are all negative and significant below 5% level, with (2), (3), (7), and (8) showing significance at 1% level. The religious pluralism is calculated using the following Herfindahl index calculation:

Relplural = 1-(catholic² + protestant² + evangelical² + jewish² +spiritism² + afrorel² + asianrel² + atheist² + other²)

Religious pluralism measures the diversity of religious belief and the results presented in table 1 and table 2 implies that the cities with more diversified religious belief experience more growth. This is not surprising but the result might not be causal. Big cities attract people from different ethnic groups with a diversified religious belief. It is natural that the big cities that attract migrants grow faster.

Economic Growth and Religious Belief

Table 5 and table 6 show evidences that the total population share that is religious is negatively related to growth. The result is made clear by the coefficients of population Atheist share in equation 1 through equation 9. All coefficients have a p-value that is less than 5 percent. Atheist does not believe in God and do not spend time with religious practice. The Atheist is the set of people that is the complement of the other set of people loosely defined as religious. So the consistent significant positive coefficients on Atheist population share show that there must be a negative relationship between economic growth and the share of population that is religious. This is inconsistent with Barro and McCleary (2003) and Noland (2005), which demonstrate the positive effect of church attendance and religious belief on economic growth. The argument in Barro and McCleary (2003) is that religious belief foster good behavior such as trust in people and good work ethics, thus improving productivity. One explanation for this result is that when people earn higher income and live more comfortable life, they no longer need to resort to religion. It is important to note that the coefficients on the Atheist share show the effects on religion with the base category being Catholic. In other word, comparing

	(1)	(2)	(3)	(4)
Variables	Growth	Growth	Growth	Growth
Log of per capita GDP	-0.0163***	-0.0205***	-0.0211***	-0.0367***
	(0.000803)	(0.00108)	(0.00109)	(0.00158)
Protestant share	0.0196**	0.00782	0.00761	0.0110
	(0.00842)	(0.00844)	(0.00842)	(0.00771)
Evangelical share	-0.0303***	0.000278	-0.000942	-0.0148**
	(0.00702)	(0.00786)	(0.00784)	(0.00746)
Jewish share	1.799	2.487**	0.961	3.570***
	(1.116)	(1.031)	(1.134)	(0.936)
Spiritism share	0.0823**	0.123***	0.120***	0.0588*
	(0.0376)	(0.0365)	(0.0364)	(0.0339)
Afrorel share	-0.131	-0.263**	-0.284***	-0.239**
	(0.0969)	(0.104)	(0.104)	(0.0942)
Asianrel share	-0.0876	0.112	0.0952	-0.0176
	(0.140)	(0.140)	(0.140)	(0.127)
Atheist share	-0.00134	-0.00994	-0.00989	0.00363
	(0.00849)	(0.00964)	(0.00961)	(0.00884)
Other share	-0.0202	-0.00276	0.000877	-0.0578
	(0.0427)	(0.0410)	(0.0408)	(0.0374)
Inverse religion pluralism	0	(0)	(0)	0
	(0.000114)	(0.000108)	(0.000108)	(0)
Elderly rate				-0.000286
				(0.000253)
Gini index				-0.0337***
				(0.00624)
Illiteracy rate				-0.000147*
				(0)
Education index				0.0857***
				(0.00729)
Urban population			0***	
			(0)	
Constant	0.135***	0.155***	0.159***	0.250***
	(0.00450)	(0.00718)	(0.00726)	(0.00944)
State Indicators	No	Yes	Yes	Yes
Observations	1,495	1,495	1,495	1,495
R-squared	0.387	0.494	0.497	0.588

TABLE 3. Growth Regressions 2000 part I

	(5)	(6)	(7)	(8)	(9)
Variables	Growth	Growth	Growth	Growth	Growth
Log of per capita GDP	-0.0354***	-0.0375***	-0.0400***	-0.0384***	-0.0379***
	(0.00163)	(0.00162)	(0.00149)	(0.00145)	(0.00162)
Protestant share	0.0113	0.0102	0.0132*	0.0142*	0.00996
	(0.00769)	(0.00766)	(0.00769)	(0.00773)	(0.00765)
Evangelical share	-0.0148**	-0.0122*	-0.00884	-0.00839	-0.0130*
0	(0.00744)	(0.00719)	(0.00717)	(0.00721)	(0.00718)
Jewish share	3.599***	3.679***	2.124**	1.964*	2.485**
	(0.933)	(0.934)	(1.037)	(1.050)	(1.025)
Spiritism share	0.0503	0.0473	0.0338	0.0389	0.0451
	(0.0339)	(0.0334)	(0.0335)	(0.0337)	(0.0333)
Afrorel share	-0.224**	-0.231**	-0.242**	-0.254***	-0.246***
	(0.0940)	(0.0940)	(0.0947)	(0.0955)	(0.0940)
Asianrel share	-0.0245	-0.00962	-0.0723	-0.0892	-0.0212
	(0.127)	(0.127)	(0.128)	(0.129)	(0.127)
Atheist share	0.00425	0.00630	0.0107	0.00839	0.00631
	(0.00881)	(0.00881)	(0.00885)	(0.00889)	(0.00879)
Other share	-0.0534	-0.0567	-0.0380	-0.0293	-0.0539
	(0.0373)	(0.0372)	(0.0373)	(0.0375)	(0.0371)
Inverse religion	· · · · /	· · · /			· · · · /
pluralism	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)
Elderly rate	-0.000269				
	(0.000253)				
Gini index		-0.0321***			-0.0321***
		(0.00626)			(0.00625)
Illiteracy rate	-0.000158**	-0.000132*			-0.000129
	(0)	(0)			(0)
Education index	0.0844***	0.0820***	0.0929***	0.0985***	0.0811***
	(0.00729)	(0.00701)	(0.00609)	(0.00599)	(0.00701)
Urban population			0***	0	
			(0)	(0)	
Constant	0.234***	0.219***	0.190***	0.231***	0.220***
	(0.00970)	(0.0145)	(0.0124)	(0.00806)	(0.0145)
State Indicators	Yes	Yes	Yes	Yes	Yes
Observations	1,495	1,495	1,495	1,495	1,495
R-squared	0 590	0 590	0.582	0 577	0 592

TABLE 4. Growth Regressions 2000 part II

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)
Variables	Growth	Growth	Growth	Growth
Protestant share	0.0582**	0.0322	0.0359	0.00322
	(0.0261)	(0.0326)	(0.0342)	(0.0208)
Evangelical share	-0.121***	-0.192**	-0.200**	-0.111*
	(0.0367)	(0.0774)	(0.0818)	(0.0640)
Jewish share	9.469	16.02	29.74	15.94
	(9.187)	(11.17)	(25.51)	(11.17)
Spiritism share	0.0625	0.0887	0.0971	-0.0127
	(0.0782)	(0.0962)	(0.103)	(0.0677)
Afrorel share	-0.543*	-1.225**	-1.289**	-1.041**
	(0.279)	(0.544)	(0.578)	(0.468)
Asianrel share	-0.700***	-0.465	-0.579	-0.512*
	(0.227)	(0.308)	(0.441)	(0.264)
Atheist share	0.219***	0.252**	0.272**	0.239**
	(0.0437)	(0.104)	(0.110)	(0.109)
Other share	-0.519	0.674	0.750	-0.0536
	(0.656)	(1.247)	(1.311)	(0.779)
Inverse religion pluralism	-0.000412	-0.000620*	-0.000615	-0.000493
	(0.000276)	(0.000373)	(0.000381)	(0.000349)
Log per capita GDP	-0.00289	-0.0228***	-0.0223***	-0.0386***
	(0.00310)	(0.00664)	(0.00682)	(0.00501)
Elderly rate				0.00165**
				(0.000738)
Gini index				-0.00662
				(0.0105)
Illiteracy rate				-0.000577***
				(0.000137)
Education index				0.0592***
				(0.0143)
Urban population			-1.35e-08	
			(1.16e-08)	
Constant	0.0591***			
	(0.0156)			
	1 270	1 270	1 270	1 270
Observations	1,370	1,370	1,370	1,370

TABLE 5. Growth Regressions 1991 Instrumental Variable part I

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Equation (2), (3), and (4) include partialed out State Indicators

	(5)	(6)	(7)	(8)	(9)
Variables	Growth	Growth	Growth	Growth	Growth
Protestant share	0.00251	0.0131	0.0233	0.0233	0.0148
	(0.0211)	(0.0224)	(0.0227)	(0.0233)	(0.0231)
Evangelical share	-0.113*	-0.123*	-0.127*	-0.131*	-0.127*
	(0.0639)	(0.0644)	(0.0671)	(0.0707)	(0.0665)
Jewish share	15.91	15.68	26.46	28.71	27.89
	(11.13)	(10.47)	(22.95)	(25.45)	(23.71)
Spiritism share	-0.0135	0.00641	-0.0105	-0.00587	0.00966
	(0.0678)	(0.0711)	(0.0741)	(0.0740)	(0.0750)
Afrorel share	-1.046**	-1.000**	-1.065**	-1.102**	-1.050**
	(0.468)	(0.460)	(0.485)	(0.498)	(0.481)
Asianrel share	-0.499*	-0.512**	-0.644*	-0.749*	-0.616
	(0.264)	(0.253)	(0.389)	(0.426)	(0.380)
Atheist share	0.240**	0.248**	0.268**	0.253**	0.265**
	(0.109)	(0.110)	(0.114)	(0.112)	(0.115)
Other share	-0.0606	-0.0269	0.114	0.0907	-0.0190
	(0.787)	(0.805)	(0.858)	(0.858)	(0.834)
Inverse of religion	· · · ·	· · ·			
pluralism	-0.000498	-0.000382	-0.000416	-0.000558*	-0.000374
	(0.000352)	(0.000295)	(0.000270)	(0.000337)	(0.000304)
Log per capita GDP	-0.0380***	-0.0436***	-0.0406***	-0.0371***	-0.0443***
	(0.00514)	(0.00564)	(0.00601)	(0.00606)	(0.00629)
Elderly rate	0.00170**				
	(0.000733)				
Gini index		0.00263			0.00102
		(0.0111)			(0.0122)
Illiteracy rate	-0.000575***	-0.000425***			-0.000472***
	(0.000137)	(0.000136)			(0.000168)
Education index	0.0579***	0.0690***	0.102***	0.116***	0.0734***
	(0.0143)	(0.0149)	(0.0176)	(0.0186)	(0.0172)
Urban population			(0)	(0)	
			(0)	(0)	
Theil index	-0.00629				
	(0.00526)				
Life expectancy		0.00141***	0.00162***		0.00137***
		(0.000297)	(0.000301)		(0.000316)
Male population				0	(0)
				(0)	(0)
Constant					
Observations	1,370	1,370	1,370	1,370	1,370

TABLE 6. Growth Regressions 1991 Instrumental Variable part II

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Equation (2), (3), and (4) include partialed out State Indicators

with a city that has a larger percent of people being Catholic, a city with a larger percent of people being Atheist experiences higher economic growth, all other things being equal.

Economic Growth and Education

Table 5 and 6 also present evidences showing education is one of the driving factors of economic growth. All coefficients of Education index in the instrumental-variable regression in 1991 are positive with p-values all smaller than 1 percent. In the last three equations, the coefficient for Education index is 0.102, 0.116, and 0.0734 with standard errors of 0.0176, 0.018, and 0.0172, respectively. Table 9 shows that no significant relationship exists between Male population share and economic growth rates, evidenced by the coefficient of -4.20e-08 with standard error of 5.15e-08 in equation (8) and the reverse-signed coefficient of 1.05e-08 with standard error of 6.50e-09 in equation (9).

Economic Growth and Life Expectancy

Similar to the case with education, we find strong evidence that life expectancy has a strong positive relationship with economic growth. This is clearly shown by the consistent and significant positive coefficients of life expectancy in the growth regressions displayed in table (1) through table (8). This holds true for both year 1991 and year 2000. It is not at all unexpected that the cities with higher life expectancy experience more economic growth.

	(1)	(2)	(3)	(4)
Variables	Growth	Growth	Growth	Growth
Ducto stant share	0.0207**	0.0167	0.0149	0.0127
Protestant snare	0.0306^{**}	0.0107	0.0148	(0.0127)
	(0.0140)	(0.0107)	(0.0109)	(0.0104)
Evangelical share	-0.0262	-0.0108	-0.00876	-0.0228
	(0.0245)	(0.0418)	(0.0421)	(0.0322)
Jewish share	1.197	1.093	-5.700	3.322
a	(2.602)	(3.810)	(6.988)	(3.742)
Spiritism share	0.0529	0.0509	0.0371	0.0457
	(0.0616)	(0.0733)	(0.0761)	(0.0722)
Afrorel share	-0.0240	-0.00995	0.0183	-0.147
	(0.180)	(0.263)	(0.269)	(0.232)
Asianrel share	-0.142	-0.0693	-0.131	-0.189
	(0.183)	(0.170)	(0.181)	(0.205)
Atheist share	0.00325	0.00625	0.00397	0.0463
	(0.0422)	(0.0750)	(0.0750)	(0.0577)
Other share	-0.461	-0.546	-0.603	-0.928
	(0.509)	(0.727)	(0.756)	(0.865)
Inverse religion pluralism	-1.87e-05	-0.000107	-0.000111	-1.52e-06
	(0.000294)	(0.000304)	(0.000306)	(0.000340)
Log per capita GDP	-0.0145***	-0.0170***	-0.0172***	-0.0350***
	(0.00252)	(0.00367)	(0.00370)	(0.00300)
Elderly rate				-0.00113*
-				(0.000608)
Gini index				-0.0375***
				(0.00856)
Illiteracy rate				-0.000185
5				(0.000131)
Education index				0.0923***
				(0.0113)
Urban population			6 40e-09*	(010110)
erean population			(3.64e-0.9)	
Constant	0 128***			
Consum	(0.0123)			
	(0.0123)			
Observations	1 370	1.370	1,370	1.370
R-squared	0.382	0.143	0.114	0.185

TABLE 7. Growth Regressions 2000 Instrumental Variable part I

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

	(5)	(6)	(7)	(8)	(9)
Variables	Growth	Growth	Growth	Growth	Growth
Protestant share	0.0115	0.00817	0.0103	0.0110	0.00689
	(0.0105)	(0.0110)	(0.0111)	(0.0111)	(0.0113)
Evangelical share	-0.0249	-0.00945	0.00508	0.00858	-0.00763
e	(0.0324)	(0.0328)	(0.0347)	(0.0353)	(0.0331)
Jewish share	3.251	3.192	-3.472	-3.768	-2.314
	(3.804)	(3.695)	(7.065)	(7.279)	(6.505)
Spiritism share	0.0356	0.0185	-0.00740	-0.00222	0.00721
1	(0.0727)	(0.0728)	(0.0772)	(0.0779)	(0.0756)
Afrorel share	-0.148	-0.134	-0.0276	-0.0305	-0.105
	(0.237)	(0.225)	(0.234)	(0.237)	(0.232)
Asianrel share	-0.191	-0.151	-0.284	-0.326	-0.201
	(0.206)	(0.195)	(0.213)	(0.223)	(0.204)
Atheist share	0.0516	0.0416	0.0216	0.0166	0.0387
	(0.0591)	(0.0555)	(0.0552)	(0.0553)	(0.0553)
Other share	-0.953	-0.848	-0.805	-0.840	-0.879
	(0.911)	(0.823)	(0.791)	(0.812)	(0.837)
Inverse religion	(00000)	(0.022)	(0, _)	(01012)	(0.000)
pluralism	-8.02e-06	8.90e-05	-2.22e-05	-8.25e-05	8.36e-05
	(0.000326)	(0.000335)	(0.000275)	(0.000267)	(0.000334)
Log per capita GDP	-0.0337***	-0.0353***	-0.0369***	-0.0354***	-0.0351***
	(0.00315)	(0.00315)	(0.00316)	(0.00327)	(0.00326)
Elderly rate	-0.00114*				
	(0.000640)				
Gini index		-0.0379***			-0.0374***
		(0.00883)			(0.00889)
Illiteracy rate	-0.000200	-0.000233			-0.000208
	(0.000135)	(0.000142)			(0.000141)
Education index	0.0909***	0.0818***	0.0959***	0.101***	0.0813***
	(0.0116)	(0.00907)	(0.00986)	(0.0108)	(0.00921)
Urban population			5.53e-09	2.61e-08	
			(3.39e-09)	(2.68e-08)	
Theil index	-0.0187***				
	(0.00384)				
Life expectancy		0.000462*	0.000746***		0.000494**
- •		(0.000243)	(0.000257)		(0.000247)
Male population		. ,		-4.20e-08	1.05e-08
* *				(5.15e-08)	(6.50e-09)
Constant				. ,	
Observations	1,370	1,370	1,370	1,370	1,370
R-squared	0.176	0.214	0.196	0.172	0.195

TABLE 8. Growth Regressions 2000 Instrumental Variable part II

Robust standard errors in parentheses

Instrumental-Variable Regressions

One religion that we observe with consistent negative relationship with economic growth is Afro-American religions. These religions also known as New World traditions are religions from West and Central Africa that developed in various nations of Latin America. Because there are explicit or implicit selection problem, simultaneity might be an issue. Since Religion share are the most likely to be endogenous, we used earlier religious shares and earlier religion pluralism measures as instrumental-variables. Instrument for endogenous religion variables are their values in 1980.

It is not uncommon to use lagged instrumental-variables, North et al (2013) point out that earlier data on religion have stronger predictive power on growth. Table 9 and table 10 presented the F-tests and P-values of first-stage regressions of the Two-Stage Least Squares. Our lagged instruments have strong predictive power. The partial correlation between the instruments and the endogenous variables are not zero. The Pvalues and F-tests listed in table 9 and table 10 show that we have strong instrumentalvariables.

After handling the potential endogeneity problem with instrumental-variables, we find evidence of the negative relationship between the Afro-American religions share and growth rate. In equation (1) through equation (8) presented in table 5 and table 6, Afro-American religions share has all negative coefficients significant at 5% level, with eight different set of control variables.

The coefficients for Evangelical share, on the other hand, were not significant in the cross-section regressions in 1991 or 2000 listed in table (1) to table (4), but significant at 5% level after we introduced instrumental-variables. Possible explanation for this is

that there are selection and simultaneity problem in Evangelical population share. The negative relationship is presented by the t-statistics of -3.30, -2.48, and -2.44 in equation (1), equation (2), and equation (3), respectively, in table 5.

Seemingly Unrelated Regressions

As previously mentioned, we used seemingly unrelated method to estimate both the coefficients and the correlations of the error terms in the equations in two points, 1991 and 2000. Basically we are estimating two cross section equations like those presented in table (1) to (4), but this time we are allowing the error terms in two different time periods to correlate. Given the assumption that there's no major change in the social and economic omitted variables between 1991 and 2010, this method is efficient in that it takes into account the correlation between the errors over time for each city. The r square is higher than the cross-section regressions.

The seemingly unrelated method is significantly different from panel data method. Seemingly unrelated method does not only allow for different interception for each time period but it basically estimates two separate equations. There is connection between the separated equations, however, that takes errors into account. The benefit is that we allow for social and historical context to change over the 20 years-time period, as comparing to making the assumption that the effect of those economic factors and religion factors hasthe same effects on growth over different years. Instead of making the unrealistic

	(1)	(2)		(2)	
Variable	F-test	P-value	F-test	P-value	F-test	P-value
Protestant	36.70	0.0000	46.11	0.0000	46.11	0.0000
Evangelical	110.09	0.0000	61.39	0.0000	61.39	0.0000
Jewish	2.63	0.0051	1.95	0.0422	1.95	0.0422
Spiritism	74.51	0.0000	38.37	0.0000	38.37	0.0000
Afrorel	22.45	0.0000	17.07	0.0000	17.07	0.0000
Asianrel	21.15	0.0000	28.69	0.0000	28.69	0.0000
Atheist	35.46	0.0000	49.43	0.0000	49.43	0.0000
Other	11.58	0.0000	8.65	0.0000	8.65	0.0000
Inv_relplura	23.17	0.0000	52.62	0.0000	52.62	0.0000
	(-	4)		(5)		(6)
Variable	F-test	P-value	F-test	P-value	F-test	P-value
Protestant	26.25	0.0000	31.63	0.0000	26.13	0.0000
Evangelical	79.90	0.0000	42.49	0.0000	79.78	0.0000
Jewish	1.64	0.0990	2.12	0.0251	1.38	0.1900
Spiritism	57.83	0.0000	26.67	0.0000	56.99	0.0000
Afrorel	16.55	0.0000	14.61	0.0000	14.49	0.0000
Asianrel	10.59	0.0000	15.95	0.0000	10.50	0.0000
Atheist	30.84	0.0000	39.83	0.0000	30.56	0.0000
Other	8.70	0.0000	8.10	0.0000	8.38	0.0000
Inv_relplura	18.60	0.0000	39.83	0.0000	18.21	0.0000
	(7)		(8)		(9)
Variable	F-test	P-value	F-test	P-value	F-test	P-value
Protestant	31.35	0.0000	27.12	0.0000	32.30	0.0000
Evangelical	42.35	0.0000	69.16	0.0000	38.84	0.0000
Jewish	1.80	0.0648	1.66	0.0947	2.05	0.0307
Spiritism	25.15	0.0000	53.75	0.0000	25.93	0.0000
Afrorel	13.22	0.0000	15.21	0.0000	14.43	0.0000
Asianrel	14.45	0.0000	9.20	0.0000	15.47	0.0000
Atheist	39.26	0.0000	29.42	0.0000	36.99	0.0000
Other	8.26	0.0000	6.74	0.0000	5.28	0.0000
Inv_relplura	39.31	0.0000	18.05	0.0000	39.59	0.0000

TABLE 9. Summary results for first-stage regressions 1991

First-stage test statistics heteroskedasticity-robust Equations all include control groups

	(10)		((11)		(12)	
Variable	F-test	P-value	F-test	P-value	F-test	P-value	
Protestant	27.11	0.0000	32.48	0.0000	25.95	0.0000	
Evangelical	69.17	0.0000	38.86	0.0000	75.02	0.0000	
Jewish	1.65	0.0957	2.07	0.0292	1.64	0.1001	
Spiritism	53.87	0.0000	25.99	0.0000	52.76	0.0000	
Afrorel	15.15	0.0000	14.45	0.0000	15.77	0.0000	
Asianrel	9.05	0.0000	15.60	0.0000	8.76	0.0000	
Atheist	29.41	0.0000	37.26	0.0000	31.68	0.0000	
Other	6.71	0.0000	5.35	0.0000	8.09	0.0000	
Inv_relplura	18.00	0.0000	38.69	0.0000	19.31	0.0000	
	(13)		((14)	(15)		
Variable	F-test	P-value	F-test	P-value	F-test	P-value	
Protestant	30.72	0.0000	26.12	0.0000	31.18	0.0000	
Evangelical	41.28	0.0000	78.63	0.0000	42.55	0.0000	
Jewish	1.95	0.0413	1.44	0.1674	1.77	0.0704	
Spiritism	24.62	0.0000	52.96	0.0000	24.25	0.0000	
Afrorel	14.36	0.0000	13.81	0.0000	13.24	0.0000	
Asianrel	15.78	0.0000	9.00	0.0000	14.36	0.0000	
Atheist	38.02	0.0000	30.79	0.0000	39.18	0.0000	
Other	6.93	0.0000	8.04	0.0000	8.45	0.0000	
Inv_relplura	38.32	0.0000	17.45	0.0000	37.97	0.0000	
	((16)	((17)		(18)	
Variable	F-test	P-value	F-test	P-value	F-test	P-value	
Protestant	25.97	0.0000	31.06	0.0000	25.92	0.0000	
Evangelical	79.04	0.0000	42.67	0.0000	74.67	0.0000	
Jewish	1.39	0.1871	1.79	0.0657	1.30	0.2304	
Spiritism	52.91	0.0000	23.94	0.0000	52.41	0.0000	
Afrorel	13.72	0.0000	12.97	0.0000	14.04	0.0000	
Asianrel	9.62	0.0000	14.63	0.0000	9.14	0.0000	
Atheist	30.61	0.0000	38.94	0.0000	31.43	0.0000	
Other	8.19	0.0000	8.37	0.0000	7.87	0.0000	
Inv_relplura	17.86	0.0000	39.05	0.0000	18.99	0.0000	

TABLE 10. Summary results for first-stage regressions 2000

First-stage test statistics heteroskedasticity-robust

assumption, we assume that the social and economic omitted variables may have effects on our dependent variable and the effects are correlated, which will be captured by the error terms in the separate equations. We found results consistent with our previous findings.

One thing that changed from the earlier results is the effect of Gini index on growth rate in year 2000 regressions changed. The relationship between Gini Index and growth rate might not be able to express in a single equation, we could have omitted some unobservable variables. The omitted variables may have effects on our dependent variable, the growth rate. After considering the effects are correlated over time for each city, it is not surprising that the coefficient on Gini Index can change. The other results we found earlier with cross-section estimations and instrumental-variable method did not change here. As presented by table (11), table (12), table (13), and table (14), we still find positive relationship between economic growth and Protestant share, Spiritism share, Atheist share, Education index, urban population, and life expectancy. We still find negative relationship between economic growth and Afro-American religion, the inverse of religion pluralism, and illiteracy rate.

	Growth	Growth	Growth	Growth
	1991	2000	1991	2000
	(1)	(2)	(3)	(4)
Log per capita GDP	-0.00545***	-0.0146***	-0.0132***	-0.0156***
	(0.00105)	(0.000790)	(0.00144)	(0.00105)
Protestant share	0.0433***	0.0157*	0.0158	0.00639
	(0.0106)	(0.00826)	(0.0105)	(0.00818)
Evangelical share	0.0137	-0.0313***	0.00278	0.00370
	(0.0123)	(0.00700)	(0.0131)	(0.00767)
Jewish share	-1.362	1.325	0.209	1.914*
	(1.280)	(1.088)	(1.145)	(0.982)
Spiritism share	0.184***	0.0371	0.157***	0.0664*
	(0.0519)	(0.0368)	(0.0489)	(0.0352)
Afrorel share	0.0470	-0.137	-0.160	-0.217**
	(0.115)	(0.0953)	(0.113)	(0.100)
Asianrel share	-0.355**	-0.184	-0.0131	0.0397
	(0.145)	(0.138)	(0.140)	(0.136)
Atheist share	0.0329**	0.00644	0.0181	-0.00943
	(0.0155)	(0.00845)	(0.0164)	(0.00939)
Other share	-0.296***	-0.0721*	-0.113*	-0.0365
	(0.0687)	(0.0418)	(0.0645)	(0.0392)
Inverse religion pluralism	-8.23e-05	4.45e-05	-0.000175***	5.41e-05
	(5.83e-05)	(0.000111)	(5.32e-05)	(0.000103)
Constant	0.0649***	0.125***	0.125***	0.127***
	(0.00556)	(0.00444)	(0.00931)	(0.00701)
State Indicators	No	No	Yes	Yes
Observations	1,454	1,454	1,454	1,454
R-squared	0.067	0.400	0.249	0.501

TABLE 11. Growth Regressions Seemingly Unrelated part I

	Growth	Growth	Growth	Growth
	1991	2000	1991	2000
	(5)	(6)	(7)	(8)
Log per capita GDP	-0.0132***	-0.0162***	-0.0317***	-0.0322***
	(0.00146)	(0.00106)	(0.00231)	(0.00157)
Protestant share	0.0156	0.00631	0.0117	0.0101
	(0.0105)	(0.00815)	(0.0103)	(0.00752)
Evangelical share	0.00285	0.00275	0.00676	-0.00964
C	(0.0132)	(0.00766)	(0.0131)	(0.00739)
Jewish share	-0.0552	0.802	1.115	3.090***
	(1.241)	(1.083)	(1.124)	(0.914)
Spiritism share	0.157***	0.0656*	0.0990**	0.0378
	(0.0489)	(0.0351)	(0.0489)	(0.0332)
Afrorel share	-0.162	-0.233**	-0.213*	-0.212**
	(0.113)	(0.100)	(0.110)	(0.0924)
Asianrel share	-0.0157	0.0272	-0.104	-0.0469
	(0.140)	(0.136)	(0.137)	(0.126)
Atheist share	0.0180	-0.00926	0.0217	0.00294
	(0.0164)	(0.00937)	(0.0162)	(0.00880)
Other share	-0.115*	-0.0333	-0.130**	-0.0687*
	(0.0647)	(0.0391)	(0.0637)	(0.0367)
Inverse religion pluralism	-0.000177***	4.68e-05	-0.000119**	5.95e-05
	(5.33e-05)	(0.000103)	(5.24e-05)	(9.53e-05)
Urban population	3.49e-10	2.49e-09**		
	(1.55e-09)	(1.06e-09)		
Gini index			0.00370	-0.0294***
			(0.00778)	(0.00615)
Illiteracy rate			- 0.000553***	-8.98e-05
5			(8.10e-05)	(7.93e-05)
Education index			0.0502***	0.0760***
			(0.0121)	(0.00725)
Constant	0.125***	0.131***	0.228***	0.223***
	(0.00946)	(0.00709)	(0.0136)	(0.00936)
State Indicators	Yes	Yes	Yes	Yes
Observations	1,454	1,454	1,454	1,454
R-squared	0 249	0 505	0 313	0 593

TABLE 12. Growth Regressions Seemingly Unrelated part II

	Growth	Growth	Growth	Growth	Growth
	1991	2000	1991	2000	1991
	(9)	(10)	(11)	(12)	(13)
Log per capita GDP	-0.0310***	-0.0314***	-0.0345***	-0.0326***	-0.0303***
	(0.00233)	(0.00163)	(0.00224)	(0.00161)	(0.00212)
Protestant share	0.0111	0.0104	0.0127	0.00941	0.0188*
	(0.0102)	(0.00750)	(0.0101)	(0.00748)	(0.0101)
Evangelical share	0.00725	-0.00985	0.000409	-0.00751	0.00422
	(0.0131)	(0.00738)	(0.0127)	(0.00713)	(0.0128)
Jewish share	1.121	3.122***	1.131	3.178***	0.441
	(1.125)	(0.912)	(1.114)	(0.912)	(1.209)
Spiritism share	0.0982**	0.0320	0.0959**	0.0274	0.0710
	(0.0489)	(0.0331)	(0.0480)	(0.0326)	(0.0482)
Afrorel share	-0.218**	-0.200**	-0.182*	-0.206**	-0.169
	(0.110)	(0.0923)	(0.109)	(0.0923)	(0.110)
Asianrel share	-0.0931	-0.0492	-0.0862	-0.0400	-0.131
	(0.137)	(0.126)	(0.136)	(0.126)	(0.137)
Atheist share	0.0217	0.00376	0.0282*	0.00519	0.0330**
	(0.0162)	(0.00877)	(0.0160)	(0.00876)	(0.0160)
Other share	-0.134**	-0.0645*	-0.132**	-0.0675*	-0.119*
	(0.0638)	(0.0366)	(0.0627)	(0.0364)	(0.0630)
Inverse religion	0.0001.00***	7.54 0.5	0.000110++	77 4 05	0.0001.40****
pluralism	-0.000120**	7.54e-05	-0.000112**	7.74e-05	-0.000140***
	(5.24e-05)	(9.52e-05)	(5.19e-05)	(9.52e-05)	(5.20e-05)
Urban population					-0
			0.00757	0.0077***	(1.50e-09)
Gini index			0.00757	-0.0277	
	0.000540***	0.000102	(0.00760)	(0.00017)	
Interacy rate	-0.000549****	-0.000103	-0.000449****	-7.83e-05	
Education index	(8.100-03)	(7.808-03)	(8.000-03)	(7.800-03)	0.07/0***
Education index	0.0491***	0.0751***	0.0502^{***}	(0.0727^{****})	(0.0102)
Life expected av	(0.0121)	(0.00726)	(0.0113)	(0.00701)	(0.0102)
Life expectancy			0.00113^{****}	0.000300^{*}	$(0.0013)^{****}$
Constant	0 228***	0.210***	(0.000214)	(0.000187)	(0.000211) 0.120***
Constant	(0.0127)	(0.00062)	(0.0176)	(0.0144)	(0.0150)
Stata Indiantana	(0.0157) Vas	(0.00962) Vec	(0.0176) Vas	(0.0144) V ac	(0.0150) V ac
State mulcators	i es	i es	1 es	i es	res
Observations	1 454	1 454	1 454	1 454	1 454
R-squared	0.314	0.595	0.325	0.593	0.310
	U.U.I.I	0.070	0.040	0.070	0.010

TABLE 13. Growth Regressions Seemingly Unrelated part III

	Growth	Growth	Growth	Growth	Growth
	2000	1991	2000	1991	2000
	(14)	(15)	(16)	(17)	(18)
	X /				
Log per capita GDP	-0.0341***	-0.0267***	-0.0329***	-0.0345***	-0.0332***
	(0.00148)	(0.00208)	(0.00144)	(0.00225)	(0.00161)
Protestant share	0.0114	0.0212**	0.0120	0.0126	0.00922
	(0.00751)	(0.0103)	(0.00754)	(0.0101)	(0.00746)
Evangelical share	-0.00502	0.00932	-0.00435	0.000426	-0.00842
	(0.00711)	(0.0129)	(0.00715)	(0.0127)	(0.00712)
Jewish share	1.789*	0.414	1.652	0.994	2.105**
	(1.011)	(1.228)	(1.023)	(1.204)	(1.004)
Spiritism share	0.0133	0.0773	0.0166	0.0960**	0.0262
	(0.0328)	(0.0489)	(0.0329)	(0.0480)	(0.0325)
Afrorel share	-0.218**	-0.199*	-0.224**	-0.182*	-0.221**
	(0.0928)	(0.111)	(0.0935)	(0.109)	(0.0922)
Asianrel share	-0.0904	-0.180	-0.108	-0.0866	-0.0519
	(0.126)	(0.139)	(0.127)	(0.136)	(0.125)
Atheist share	0.00824	0.0236	0.00633	0.0282*	0.00531
	(0.00878)	(0.0162)	(0.00882)	(0.0160)	(0.00874)
Other share	-0.0542	-0.119*	-0.0477	-0.133**	-0.0649*
	(0.0365)	(0.0639)	(0.0367)	(0.0628)	(0.0364)
Inverse religion					
pluralism	7.85e-05	-0.000152***	5.53e-05	-0.000114**	7.18e-05
	(9.58e-05)	(5.27e-05)	(9.61e-05)	(5.19e-05)	(9.50e-05)
Urban population	2.38e-09**	-6.65e-09	8.34e-09		
	(9.75e-10)	(2.57e-08)	(2.03e-08)		
Gini index				0.00761	-0.0280***
				(0.00760)	(0.00616)
Illiteracy rate				-0.000450***	-7.83e-05
				(8.06e-05)	(7.78e-05)
Education index	0.0790***	0.0893***	0.0832***	0.0501***	0.0724***
	(0.00609)	(0.0101)	(0.00600)	(0.0113)	(0.00700)
Life expectancy	0.000562***			0.00113***	0.000398**
	(0.000183)			(0.000214)	(0.000187)
Male population		1.27e-08	-1.24e-08	3.41e-10	4.97e-09**
		(5.27e-08)	(4.09e-08)	(3.04e-09)	(1.95e-09)
Constant	0.174***	0.184***	0.204***	0.169***	0.201***
	(0.0123)	(0.0114)	(0.00798)	(0.0177)	(0.0144)
State Indicators	Yes	Yes	Yes	Yes	Yes
Obcomentions	1 45 4	1 454	1 454	1 454	1 454
Deservations	1,454	1,454	1,454	1,454	1,454
к-squarea	0.585	0.290	0.581	0.325	0.396

TABLE 14. Growth Regressions Seemingly Unrelated part IV

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

CHAPTER FIVE

Discussion

We have used a city-level data in Brazil that includes demographics and religious beliefs. The dataset are derived from data provided by Institute of Geography and Statistics consisting of individual information collected between 1980 and 2010 in Brazil. We believe that this data, as opposed to the more popular country-level data, could separate the effects of religious beliefs on economics growth from different historical and social context.

We estimated cross-section for both the 1991 to 2000 period and the 2000 to 2010 period. We also constructed a set of lagged instrumental variables to estimate the effect of religion on growth. The instruments are the religious share and religious pluralism in 1980. Finally, we used the seemingly unrelated methodology to estimate the effect again, this time allowing for correlation between errors in each city over time.

The instrumental variables we use are strong and exogenous. In the seemingly unrelated regressions we believe that the correlation between the errors over time have explanatory power and thus increase efficiency of the estimate. Over all, the results obtained by these two methods are consistent with the finding in cross-section estimation.

Our results show the positive relationships between economic growth and Protestant share, Spiritism share, Atheist share, Education index, urban population, and life expectancy. We find negative relationships between economic growth and Afro-American religion, the inverse of religion pluralism, and illiteracy rate. All effects of

religious share are relative to the base category, Catholics. Comparing with a city that has a larger percent of people being Catholic, cities with a larger percent of people being Atheist, Protestant, and Spiritism have higher economic growth, all other things being equal. These results are supported by the certain characteristics of the above religions. The Protestant ethics emphasize the importance of work and making progress. The devotion from workers with the Protestant ethics drives the economic growth. It is also not hard to see why there is a positive relationship between growth and Spiritism, the religion that made possible a big movement to build charity institutions such as hospitals and to benefit millions of people in Brazil.

There are also limitations to our study. The survey by Iannaccone (1998) separates studies of religion and economics primarily of interest to economists into two lines: research into economic interpretation of religious behavior and research into economic consequences of religion. Our study falls into the later. We believe a common weakness in this research is that the popular country-level data cannot separate the effect from different social and historical context. To handle this issue in our study, we resort to a city-level data set. Another advantage of using within country analysis in economics growth studies is that there are no exchange rate and price variations. Using only data in Brazil, we cannot conclude the effect of religious behavior on income in other country because the effect might not be homogeneous around the world. In future research, we wish to obtain more city-level data in different country around the globe and to be able to conclude on whether the effects of religion on growth are homogeneous.

There are other explanations possible, such as religion self-selection based on education. For example, Protestant consist of many highly educated people. Literature have not found a way to deal with this problem. We believe, however, that such an issue may not over turn our results.

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