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Can Religion Save Our Health?: Quasi-Experimental Evidence from the U.S.†

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There is a large amount of empirical literature reporting that people who regularly attend religious services tend to have better health outcomes. However, it remains an unanswered question as to whether the observed correlation reflects any causality. Exploiting exogenous changes in church attendance driven by law changes in 21 states of the U.S., I find tentative but suggestive evidence that the observed strong correlation between religious participation and health is likely to be driven by endogenous selection.

Key Word: U.S., Religious Participation, Subjective Health, Blue Law, Causal Inference, Instrumental Variable
JEL Code: I18, Z12, K20

I. Introduction

Governments in many countries favor religion in many respects. According to a survey by the Pew Research Center, 83 out of the 199 countries around the world either officially endorse or unofficially favor particular religions (Pew Research Center, 2017). The survey categorizes Korea as one of the 106 countries with no official or preferred religion. However, even in Korea, religion has been enjoying various favors in, for example, taxation and property ownership.

The policy biases for religion are partly based on the belief that religion has beneficial impacts on social outcomes. Given that these policy biases are costly, the evidence for positive externalities needs to be firm. Hence, many social scientists have long been interested in understanding how religious participation affects various social outcomes.[1] However, the evidence for a causal effect of religion is still largely unknown, mainly because it is challenging to isolate exogenous

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[1]The scope of the literature has covered a wide range of areas, such as pro-social behavior (Shariff and Norenzayan, 2007; Norenzayan and Shariff, 2008), life satisfaction (Diener and Diener, 2009; Lim and Putnam, 2010), political participation (Brady, Verba, and Schlozman, 1995; Jones-Correa and Leal, 2001; Campbell, 2013), among others.

variations with regard to religious participation. The recent controversy over religious taxation in Korea is also partly due to the lack of firm evidence of any beneficial impacts of religious participation on social outcomes.

This study revisits the well-documented potential benefit of religion on health by exploiting regulation-driven changes in religious attendance in the U.S. There are numerous empirical studies reporting positive correlations between religious participation and various health measures.[2] However, it remains debatable as to whether these observed correlations reflect causal relationships. For example, it may be that people with healthier lifestyles are also more religious or that poor health induces people to adopt a religion (Deaton, 2011).

In order to identify the causal effect of religious participation, this study investigates the repeal of what are known as the blue laws in the U.S. The blue laws, also known as 'day-of-rest' acts, restricted secular activities such as labor and commerce on Sundays in order to encourage people to attend church services. The blue laws were widely implemented in many states of the U.S. until the 1950s but were repealed in many states starting in the early 1960s. Gruber and Hungerman (2008) found that the repeal of the blue laws reduced church attendance significantly. Building on their original work, this study tests whether the observed strong correlation reported in the literature reflects a causal relationship.[3]

II. Data

The data of this study are from the General Social Survey (GSS) over the period between 1973 and 2000. The GSS is a cross-sectional survey on nationally representative sample of non-institutionalized individuals aged 18 or older in the U.S. The GSS is virtually the only data source gathering information on religious attendance and health measure of nationally representative respondents over several decades.

For information on blue law repeals, this study draws on the legal classification by Gruber and Hungerman (2008). According to Gruber and Hungerman (2008), there are 16 states with discrete and significant changes in the regulation on secular activities on Sundays. Table 1 lists the 16 states with significant law changes and 8 states that never had any blue law. The other 26 states are excluded because blue laws were implemented at the city or county level (20 states), laws were repealed gradually over time by adding exceptions to prohibited activities (6 states) (Gruber and Hungerman, 2008: 834-835).

[2]For example, Deaton (2011) found that religiosity is closely associated with better health outcomes using Gallup World Poll data covering 140 countries and 300,000 observations. Hummer *et al*. (1999) analyzed National Health Interview Survey data and found that those who never attend church tend to display higher levels of mortality risk than those who attend church regularly, even after controlling for baseline health status. Koenig, King, and Carson (2012) and Ellison and Levin (1998) summarize hundreds of studies suggesting that more religious people tend to report better health measures.

[3]This study also contributes to the recent literature on understanding the causal effect of religious participation in light of the repeal of blue laws (Cohen-Zada and Sander, 2011; Gerber, Gruber, and Hungerman, 2016).

TABLE 1— TIMING OF THE REPEAL OF BLUE LAW (24 STATES)

Year of repeal	States
1955	Iowa*
1965	Kansas*
1966	Washington*
1969	Florida*
1973	Ohio*, Utah*
1975	Virginia*
1977	Indiana*, South Dakota*
1978	Pennsylvania*
1981	Tennessee*
1982	Vermont*
1985	Minnesota*, South Carolina*, Texas*
1991	North Dakota*
Never had such laws	Arizona*, California*, Colorado*, Idaho, Nevada, New Mexico, Oregon*, Wyoming*

Source: Table 1 of Gruber and Hungerman (2008, p.835). The other 26 states are excluded because blue laws were implemented at the city or county level (20 states), or laws were repealed gradually over time by adding exceptions to the list of prohibited activities (6 states) (Gruber and Hungerman, 2008; p.834-5). The 21 states included in the estimation sample are marked with an asterisk.

Following Gruber and Hungerman (2008), I restrict my sample to those who are Protestant or Catholic because people who follow those religions are most likely to have been affected by the blue laws. I additionally drop observations collected during the exact years the laws were repeal due to the ambiguity arising when attempting to determine whether the blue laws were in place during those years or not. Consequently, my estimation sample consists of 17,329 individuals in the years 1973-2000 in 21 states that either experienced discrete and significant changes in blue laws (16 states) or never had such laws at all (5 states).[4]

Table 2 summarizes the descriptive statistics of the estimation sample. The variable of interest in this study is a subjective health measure. The GSS asks how respondents would describe condition of their own health. There are four possible responses to this question: poor, fair, good, and excellent. Unfortunately, approximately 24% of the respondents refused to report their health conditions. To maximize the sample size, I include these observations in my sample and add an indicator for missing health information as a covariate in regression analyses.[5] I dichotomize the subjective health variable in two different ways (1 if excellent and 0 otherwise; 1 if poor and 0 otherwise) and use the dummies as outcome variables.

[4] The 21 states used for this study are listed in Table 1, marked with an asterisk.

[5] As a robustness check, I also report estimation results when the observations with missing health conditions are dropped in the appendix (Table A1). The main results of this study do not change much when the observations with missing health information are excluded.

TABLE 2—SUMMARY STATISTICS

Variable	N	Mean	Std. Dev.	Min	Max
Religious attendance					
Weekly or more often	17,329	0.31	0.46	0	1
Monthly but less than weekly	17,329	0.23	0.42	0	1
Yearly but less than monthly	17,329	0.26	0.44	0	1
Never or less than yearly	17,329	0.19	0.39	0	1
Linear index (1-4)	17,329	2.67	1.11	1	4
Health condition					
Excellent	17,329	0.24	0.43	0	1
Good	17,329	0.34	0.47	0	1
Fair	17,329	0.14	0.35	0	1
Poor	17,329	0.04	0.20	0	1
Don't know or refuse to answer	17,329	0.24	0.43	0	1
Female	17,329	0.58	0.49	0	1
Age (years, top-coded at 89)	17,329	46.09	17.76	18	89
Age 89 or older	17,329	0.01	0.07	0	1
Age imputed	17,329	0.00	0.05	0	1
Nonwhite	17,329	0.12	0.33	0	1
Education (years)	17,329	12.54	3.03	0	20
Education imputed	17,329	0.00	0.04	0	1
Family income (natural log)	17,329	3.05	0.90	-1.10	5.09
Family income imputed	17,329	0.09	0.28	0	1
Married	17,329	0.58	0.49	0	1
Protestant	17,329	0.74	0.44	0	1
Catholic	17,329	0.26	0.44	0	1
Labor market status					
Employed	17,329	0.60	0.49	0	1
Unemployed	17,329	0.03	0.16	0	1
Out of labor force	17,329	0.37	0.48	0	1
Working hours per week	10,392	41.19	13.82	0	89

Note: All variables are indicators (yes=1, no=0) unless units are specified in parenthesis.

About 24% of the respondents reported that their health conditions are excellent, while 4% answered poor.

The GSS also asks its respondents how often they attend religious services. The nine possible answers to this question are never, less than once a year, once a year, several times a year, once a month, two to three times a month, nearly every week, every week, and more than once a week. Based on this information, I define a linear index on a scale of four: never or less than once a year (=1), at least once a year but less than once a month (=2), at least once a month but less than once a week (=3), and once a week or more (=4). Roughly 31% of the respondents in my sample reported that they attend religious services weekly or more often, while about 19% report that they attend less than once a year. I mainly use the linear index in the analysis, but I also present results when the religious attendance measure is treated as a categorical variable.

Other variables used in this study are gender, age, race (nonwhite=1), education (in years), family income (in 1986 constant dollars), religion (protestant or catholic), labor market status (employed, unemployed, out of the labor force), and working hours (in a week). Women are over-represented (58%) in my sample, mainly because women tend to be more religious than men and because my sample is restricted to those who are either protestant or catholic. Age is top-coded at 89. The proportion of top-coded observations (i.e., aged 89 or older) is around 0.5%. Approximately 9%, 0.3%, and 0.2% of the respondents did not report their income, age, and education, respectively. To secure as many observations as possible, I impute the missing information with the median values and add indicators for the imputation to the list of covariates in regression analyses. The number of observations with regard to working hours is lower (=10,392) because hours of work can only be observed for those who are employed.

III. Data and Estimation Strategy

In order to understand how the repeal of the blue laws affected the level of religious participation, I begin by devising the following equation,

$$\text{Attend}_{ist} = \beta_0 + \beta_1 \text{Repeal}_{st} + X_{it}\gamma + \delta_t + \theta_s + \varepsilon_{ist}, \quad (1)$$

where Attend_{ist} represents the linear index of religious attendance of individual i in state s during year t, Repeal_{st} denotes an indicator for whether the blue laws were repealed in state s in year t, X_{it} is a vector of covariates such as age, gender, race, education, marital status, income, and a dummy for Catholic; δ_t and θ_s represent year and state dummies, respectively; and ε_{ist} is an error term. The difference-indifferences parameter β_1 captures whether the repeal of a state's blue laws causes a decrease in religious participation relative to that in other states at a given t. I estimate equation (1) using the OLS method, clustering standard errors at the interactions between state and year. In survey years 1982 and 1987, the GSS oversampled blacks. All estimates are weighted in order to ensure a nationally representative sample under the GSS sampling scheme.

The estimation result of equation (1) is presented in column 1 of Table 3. I find that the repeal of blue laws is negatively associated with the religious attendance index. The magnitude of the coefficient (-0.125) is sizable, amounting to roughly half of the coefficient for females (0.268). This suggests that the potential impact of the repeal of the blue laws on religious attendance is comparable to half of the observed gap in religious attendance between men and women. The coefficients of the other covariates are qualitatively similar, as reported in the literature (e.g., Azzi and Ehrenberg, 1975). Older, female, more educated people attend religious services more often than those younger, male, and less educated people.

A key assumption for interpreting the estimate as causal is that states with and without law changes follow a common time trend with regard to the dependent

variable. If blue laws were repealed in states where religious participation was in decline anyway, the observed correlation between the law repeals and religious participation would be spurious. In column 2, I add state-specific linear time trends to the list of controls in order to relax this assumption. The addition of the state-specific time trends makes the estimated effect of the repeal of blue laws even stronger (-0.167).

In columns 3 and 4, I also add a placebo dummy indicating a period of 1-2 years prior to the repeal of the laws with and without the state-specific time trends, respectively. If the repeal of the blue laws was driven by some predetermined socioeconomic changes that reduced people's religiosity (i.e., reverse causality), the placebo dummy would have a significant coefficient. However, the estimated coefficients of the placebo dummy are negligible in magnitude and are statistically insignificant. These results suggest that the estimated effects of repealing the blue laws are not likely to be driven by reverse causality.

Overall, the estimation results in Table 3 suggest that repealing blue laws significantly reduced religious participation. However, it is difficult to interpret the magnitude of the estimated effects because the categorical religious attendance measure is treated as a continuous variable. In order to understand the effects more

TABLE 3—EFFECTS OF REPEALING BLUE LAWS ON RELIGIOUS PARTICIPATION

	(1)	(2)	(3)	(4)
Dependent variable	Attendance index (1-4)			
Repeal	-0.125***	-0.167***	-0.117***	-0.175***
	(0.037)	(0.052)	(0.040)	(0.063)
Repeal (placebo)			0.022	-0.012
			(0.049)	(0.056)
Age	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.268***	0.268***	0.268***	0.268***
	(0.017)	(0.017)	(0.017)	(0.017)
Nonwhite	0.349***	0.348***	0.349***	0.348***
	(0.026)	(0.027)	(0.026)	(0.027)
Education	0.051***	0.051***	0.051***	0.051***
	(0.003)	(0.003)	(0.003)	(0.003)
Log income	0.009	0.009	0.009	0.009
	(0.011)	(0.011)	(0.011)	(0.011)
Married	0.187***	0.187***	0.187***	0.187***
	(0.021)	(0.021)	(0.021)	(0.021)
Catholic	0.232***	0.233***	0.232***	0.233***
	(0.025)	(0.025)	(0.025)	(0.025)
State and year FE	Y	Y	Y	Y
State-specific time trend	N	Y	Y	N
Observations	17,329	17,329	17,329	17,329
R-squared	0.086	0.089	0.086	0.089

Note: The dependent variable is a linear index of religious attendance. All regressions control for dummies for median-value imputation (age, education, income) and missing information for health condition. Robust standard errors clustered at the state-by-year level are in parenthesis. Significance *** 1%; ** 5%; * 10%.

clearly, I re-estimate equation (1) by replacing the linear index (Attend) with dummies for each of the four attendance categories separately. These results are summarized in Table 4. Overall, repealing these laws reduced the probabilities for attending weekly or more often (Attend=4) by 3.7%p; the repeals also reduced those for monthly attendance, but at a rate less than the weekly rate (Attend=3) by 2.5%p, while an increase was found for yearly, though it was less than the monthly rate (Attend=2) by 3.6%p and less than the yearly rate or the 'never' reply (Attend=1) by 2.6%p.[6] This suggests that repealing the laws shifted the distribution of the attendance frequency to the left.

The estimation results in Tables 3 and 4 indicate that repealing blue laws decreased religious participation significantly. Hence, if religious participation is indeed causally linked to health, the decreased level of religious participation due to the repealing of these laws would lead to a decreased level of health conditions as well. In order to test this hypothesis, I re-estimate equation (1) by replacing the dependent variable with two dichotomous variables for subjective health condition:

TABLE 4—EFFECTS OF REPEALING BLUE LAWS ON RELIGIOUS PARTICIPATION

	(1)	(2)	(3)	(4)
Dependent variable	Attend=1	Attend=2	Attend=3	Attend=4
Repeal	0.0257**	0.0364**	-0.0248*	-0.0374**
	(0.0119)	(0.0146)	(0.0147)	(0.0166)
Age	-0.0006***	-0.0031***	-0.0007***	0.0044***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Female	-0.0558***	-0.0604***	0.0208***	0.0955***
	(0.0064)	(0.0069)	(0.0065)	(0.0070)
Nonwhite	-0.1214***	-0.0374***	0.0900***	0.0689***
	(0.0086)	(0.0106)	(0.0111)	(0.0118)
Education	-0.0158***	-0.0041***	0.0048***	0.0151***
	(0.0011)	(0.0012)	(0.0012)	(0.0013)
Log income	-0.0083**	0.0032	0.0094**	-0.0043
	(0.0041)	(0.0045)	(0.0042)	(0.0045)
Married	-0.0418***	-0.0284***	-0.0044	0.0747***
	(0.0075)	(0.0078)	(0.0072)	(0.0082)
Catholic	-0.0679***	-0.0108	-0.0070	0.0857***
	(0.0072)	(0.0086)	(0.0079)	(0.0112)
State and year FE	Y	Y	Y	Y
Observations	17,329	17,329	17,329	17,329
R-squared	0.0571	0.0303	0.0183	0.0653

Note: Dependent variables are dummies for each of four categories of religious attendance: never or less than once a year (Attend=1), once a year but less than once a month (Attend=2), once a month but less than once a week (Attend=3), and once a week or more often (Attend=4). All regressions control for dummies for median-value imputation (age, education, income) and missing information for health condition. Robust standard errors clustered at the state-by-year level are in parenthesis. Significance *** 1%; ** 5%; * 10%.

[6] For comparison, the unconditional mean values of the probability of attending weekly or more frequently in my sample are 26% for males and 35% for females. Thus, the estimated effect of repealing the blue laws on the probability of attending weekly or more frequently (-3.7%p) roughly amounts to 40% of the observed gender gap in the probability (9%p).

TABLE 5—EFFECTS OF REPEALING BLUE LAWS ON SUBJECTIVE HEALTH CONDITION

	(1)	(2)	(3)	(4)
Dependent variable	Excellent=1		Poor=1	
Repeal	0.009	0.020	0.008	-0.003
	(0.012)	(0.018)	(0.007)	(0.010)
Age	-0.003***	-0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	-0.020***	-0.020***	-0.001	-0.001
	(0.007)	(0.007)	(0.003)	(0.003)
Nonwhite	-0.047***	-0.048***	0.004	0.004
	(0.010)	(0.010)	(0.005)	(0.005)
Education	0.017***	0.017***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Log income	0.040***	0.040***	-0.024***	-0.024***
	(0.004)	(0.004)	(0.003)	(0.003)
Married	-0.006	-0.006	-0.002	-0.003
	(0.007)	(0.007)	(0.003)	(0.003)
Catholic	-0.007	-0.007	-0.001	-0.001
	(0.007)	(0.007)	(0.003)	(0.003)
State and year FE	Y	Y	Y	Y
State-specific time trend	N	Y	N	Y
Observations	17,329	17,329	17,329	17,329
R-squared	0.155	0.156	0.072	0.073

Note: Dependent variables are dummies for subjective health conditions (1 if excellent/poor and 0 otherwise). All regressions control for dummies for median-value imputation (age, education, income) and missing information on health condition. Robust standard errors clustered at the state-by-year level are in parenthesis. Significance *** 1%; ** 5%; * 10%.

a dummy for excellent health condition and a dummy for a poor health condition. These results are summarized in Table 5, where columns 1 and 2 show the results for the excellent health condition while columns 3 and 4 summarize those for the poor condition. Regardless of the choice of dependent variable, I do not find any evidence that repealing the blue laws affected subjective health conditions. This can be taken as indirect evidence suggesting that there is no causal link between religious participation and health outcomes.

To find more direct evidence of whether religious participation affects health outcomes, I consider the following regression model:

$$\text{Health}_{ist} = \beta_0 + \beta_1 \text{Attend}_{ist} + X_{it}\gamma + \delta_t + \theta_s + \varepsilon_{ist} \quad (2)$$

In equation (2), β_1 captures the correlation between religious participation and health conditions. Table 6 summarizes the estimation results for the probabilities of having excellent (columns 1 and 2) and poor health conditions (columns 3 and 4). The odd-numbered columns show naïve OLS estimation results for equation (2). As in the literature, I find that religious participation is strongly correlated with health conditions. People attending religious services more frequently tend to report more often excellent health conditions and less often poor conditions. More

TABLE 6— RELIGIOUS PARTICIPATION AND SUBJECTIVE HEALTH CONDITION

	(1)	(2)	(3)	(4)
Dependent variable	Excellent=1		Poor=1	
Estimation	OLS	2SLS	OLS	2SLS
Attendance index	0.0202***	-0.0732	-0.0079***	-0.0623
	(0.0029)	(0.0991)	(0.0016)	(0.0565)
Age	-0.0028***	-0.0020**	0.0016***	0.0021***
	(0.0002)	(0.0009)	(0.0001)	(0.0005)
Female	-0.0253***	-0.0002	0.0013	0.0159
	(0.0068)	(0.0285)	(0.0027)	(0.0157)
Nonwhite	-0.0543***	-0.0216	0.0069	0.0260
	(0.0097)	(0.0368)	(0.0052)	(0.0202)
Education	0.0159***	0.0206***	-0.0049***	-0.0021
	(0.0012)	(0.0052)	(0.0007)	(0.0029)
Log income	0.0399***	0.0408***	-0.0243***	-0.0237***
	(0.0038)	(0.0041)	(0.0026)	(0.0027)
Married	-0.0097	0.0079	-0.0009	0.0093
	(0.0068)	(0.0190)	(0.0032)	(0.0109)
Catholic	-0.0118*	0.0101	0.0003	0.0131
	(0.0071)	(0.0244)	(0.0034)	(0.0134)
Observations	17,329	17,329	17,329	17,329
R-squared	0.1575	0.0476	0.0732	-0.0220
First-stage F		11.73		11.73
P-value of AR F statistic		0.452		0.261

Note: Dependent variables are dummies for subjective health condition (1 if excellent/poor and 0 otherwise). All regressions control for dummies for median-value imputation (age, education, income) and missing information on health condition as well as state and year dummies. Robust standard errors clustered at the state-by-year level are in parenthesis. Significance *** 1%; ** 5%; * 10%.

precisely, a unit increase in the attendance measure is associated with a greater probability by 2% of reporting excellent health conditions and a lower probability by 0.8% of reporting poor health conditions. For comparison, a one year increase in age is associated with a lower probability by 0.28% of reporting excellent health conditions and a higher probability by 0.16% of reporting poor health conditions. This suggests that on average, a unit increase in the attendance index is correlated similarly with an increase in reported health condition as an increase in age by 5-7 years.

In order to check whether the observed strong correlation between religious participation and health conditions reflects a causal relationship, I subsequently attempt to estimate equation (2) by the two-stage least square (2SLS) method using Repeal_{st} as an instrumental variable for Attend_{ist}. The key identification assumptions with regard to the instrumental variable (IV) strategy are that blue laws should affect religious participation (first-stage condition) and that these laws may affect health conditions, but only through their impacts on religious participation (exclusion restriction). The first-stage assumption appears to be convincing given the estimation results in Tables 3 and 4, whereas it is still possible that repealing

the laws affected health outcomes through many other channels apart from religious participation. Presumably, the most important channel would be through an effect on labor supply of individuals. As mentioned in chapter 1, blue laws as implemented prohibited all types of labor and commerce on Sundays. Hence, the repeal of the blue laws was likely to induce people to work more. It has been widely discussed that longer working hours are closely related to lower health conditions.[7] To the extent that the potential increase in the labor supply driven by the repeals of blue laws affects health conditions directly other than by affecting religious participation, the validity of the exclusion restriction would be questionable.

To check this possibility, I examine the effect of blue laws on the labor supply. Specifically, I re-estimate equation (1) replacing the dependent variable with dummies representing a person's labor market status (employed, unemployed, and out of the labor force) and usual weekly hours of work for those who are employed. Table 7 summarizes these estimation results. I do not find evidence that repealing blue laws changed the labor supply of respondents in my sample, indicating that the potential effects of the blue laws on health by affecting the labor supply are not likely to be substantial.

TABLE 7— EFFECTS OF REPEALING BLUE LAWS ON THE LABOR SUPPLY

	(1)	(2)	(3)	(4)
Dependent var.	Employed=1	Unemployed=1	OLF=1	Hours of work
Repeal	-0.0108	0.0055	0.0053	-0.0817
	(0.0131)	(0.0050)	(0.0130)	(0.4586)
Age	-0.0098***	-0.0009***	0.0107***	-0.0428***
	(0.0002)	(0.0001)	(0.0002)	(0.0117)
Female	-0.1652***	-0.0316***	0.1968***	-6.5071***
	(0.0077)	(0.0028)	(0.0077)	(0.2737)
Nonwhite	0.0301***	0.0072	-0.0373***	-0.2312
	(0.0109)	(0.0044)	(0.0113)	(0.3231)
Education	0.0155***	-0.0025***	-0.0130***	0.2881***
	(0.0012)	(0.0004)	(0.0011)	(0.0561)
Log income	0.1166***	-0.0124***	-0.1042***	3.1520***
	(0.0050)	(0.0019)	(0.0048)	(0.2269)
Married	-0.0439***	-0.0134***	0.0573***	-1.3718***
	(0.0085)	(0.0028)	(0.0084)	(0.2946)
Catholic	0.0008	-0.0008	0.0001	0.1910
	(0.0078)	(0.0028)	(0.0073)	(0.3143)
State and year FE	Y	Y	Y	Y
Observations	17,329	17,329	17,329	10,392
R-squared	0.2899	0.0347	0.3175	0.1132

Note: Dependent variables are dummies for labor market status in columns 1-3 and usual hours of work in a week in column 4. "OLF" stands for "out of the labor force." All regressions control for dummies for median-value imputation (age, education, income) and missing information for health condition. Robust standard errors clustered at the state-by-year level are in parenthesis. Significance *** 1%; ** 5%; * 10%.

[7] Sparks *et al*. (1997) reviews the literature on working hours and health conditions extensively.

Even-numbered columns in Table 6 show the two-stage least square (2SLS) estimation results for equation (2) when the law repeal dummy is used as an instrument variable for religious participation. The first-stage F statistic (11.73) is slightly higher than the rule-of-thumb critical value suggested by Stock and Yogo (2005), suggesting that the instrumental variable is likely to meet the first-stage condition. I also present the p-value of the F test of the significance of an endogenous regressor by Anderson and Rubin (1949), which is robust to the weak instrument problem. The 2SLS estimation results in Table 6 are in stark contrast to the parallel OLS estimation result. The OLS estimation results show that religious participation is strongly correlated with health outcomes, while the observed correlations between religious participation and health outcomes disappear when using the 2SLS estimation method. These results suggest that the observed correlations between religious participation and health conditions are likely to be driven by selectivity bias, rather than reflecting a causal relationship.

IV. Conclusion

There is ample empirical literature that reports positive correlations between religious participation and various health outcomes. However, it is still an unanswered question as to whether such correlations reflect a causal relationship between religion and health. In order to address this issue, I exploit a policy-driven increase in the opportunity cost of religious participation as an exogenous source of variation in religious participation.

Using the 1973-2000 GSS data, I find that repealing the blue laws significantly reduced religious participation. In spite of the substantial impact of these laws on religious participation, however, I find no evidence that the health conditions of the respondents here were worsened when they reduced their rate of religious participation in response to the repeal of the blue laws. I also find that the survey respondents' levels of religious participation are strongly correlated with their health conditions, as reported in the literature, whereas this association disappears when the potential unobserved heterogeneity with respect to religious participation is corrected by using the blue laws as an instrumental variable. Based on these results, I conclude that the strong relationships between religious participation and health conditions reported in earlier empirical studies are likely to have been driven by endogenous selection rather than a causal relationship.

I acknowledge that my findings should be taken as suggestive but only tentative evidence against a causal relationship between religious participation and health because there could be other, perhaps very important, dimensions of religious participation that cannot be captured by assessing the frequency of religious attendance. I leave these issues for future research. Presumably, this may be why Deaton (2011) noted in his paper on religion and health that he does not know any credible means of distinguishing causality between the two factors.

APPENDIX

TABLE A1— RELIGIOUS PARTICIPATION AND SUBJECTIVE HEALTH CONDITION: USING A RESTRICTED SAMPLE

	(1)	(2)	(3)	(4)
Dependent variable	Excellent=1		Poor=1	
Estimation	OLS	2SLS	OLS	2SLS
Attendance index	0.0278***	-0.1029	-0.0112***	-0.0958
	(0.0037)	(0.1503)	(0.0020)	(0.0842)
Age	-0.0037***	-0.0025*	0.0022***	0.0029***
	(0.0002)	(0.0014)	(0.0001)	(0.0008)
Female	-0.0335***	0.0015	0.0020	0.0247
	(0.0086)	(0.0428)	(0.0035)	(0.0232)
Nonwhite	-0.0648***	-0.0216	0.0072	0.0352
	(0.0122)	(0.0527)	(0.0065)	(0.0284)
Education	0.0205***	0.0271***	-0.0062***	-0.0020
	(0.0014)	(0.0078)	(0.0008)	(0.0042)
Log income	0.0507***	0.0517***	-0.0310***	-0.0304***
	(0.0048)	(0.0052)	(0.0032)	(0.0034)
Married	-0.0111	0.0122	-0.0020	0.0130
	(0.0088)	(0.0268)	(0.0042)	(0.0152)
Catholic	-0.0138	0.0146	-0.0002	0.0182
	(0.0091)	(0.0343)	(0.0044)	(0.0185)
Observations	13,207	13,207	13,207	13,207
R-squared	0.0843	-0.0105	0.0780	-0.0795
First-stage F		6.763		6.763
P-value of AR F statistic		0.477		0.236

Note: Estimation sample is restricted to those who reported their health conditions. Dependent variables are dummies for subjective health condition (1 if excellent/poor and 0 otherwise). All regressions control for dummies for median-value imputation (age, education, income) and missing information on health condition as well as state and year dummies. Robust standard errors clustered at the state-by-year level are in parenthesis. Significance *** 1%; ** 5%; * 10%.

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