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The Effects of Religiosity on Fatalities from Violent Behavior

Violent behavior, towards oneself or others, apart from causing uncountable intangible damage to families and friends of the victims, cost the U.S. economy $69,745,814,784 in 2010 (Centers for Disease Control Prevention, 2014). Unlike unintentional injuries, probably many of the 38,364 suicides and 14,722 homicides could have been prevented. Among the factors that can prevent or induce violence is religion. This leads to the following two questions of the paper. Does religiosity have an impact on fatalities from violent behavior? Is this impact stronger than the effect of religiosity on fatalities from causes other than violent behavior?

For my analysis, I perform fixed-effects regressions on panel data from 52 U.S. states and territories in the time period 1968-2016. I find that decreased religiosity may increase the number of suicides, homicides, fatalities from motor vehicle accidents, and fatalities from circulatory system diseases. However, these findings are suggested only by using the "anti-evolution laws" as an instrumental variable, and the other two specifications do not show any significant results. I suggest that this may come from the heterogeneity of outcomes for church attendance, which has little effect, and religious beliefs, which have a strong and significant effect.

The rest of this paper is organized as follows. Section 1 lays out the background. Section 2 presents the empirical strategy. Section 3 describes the dataset and variables. Section 4 presents the results. Section 5 discusses the results. Section 6 concludes.

1. Background

A. Violent Behavior in Numbers

Every day of 2017, on average 129 individuals in the United States decided to end their lives (CDC 2017). In the course of one year, those numbers added up to 47,173 deaths by suicide, which made them the 10th leading cause of death in the country (CDC 2017). Suicide is a tragedy that can affect any group in the society, no matter what age, race, sexual orientation, educational or professional background, although groups are more prone to suicide than others. For example, suicide was the second leading cause of death among people aged 10-34 (National Institute of Mental Health, 2019). Unfortunately, suicide rate has been steadily increasing over the past 10 years, as presented in the graph below:

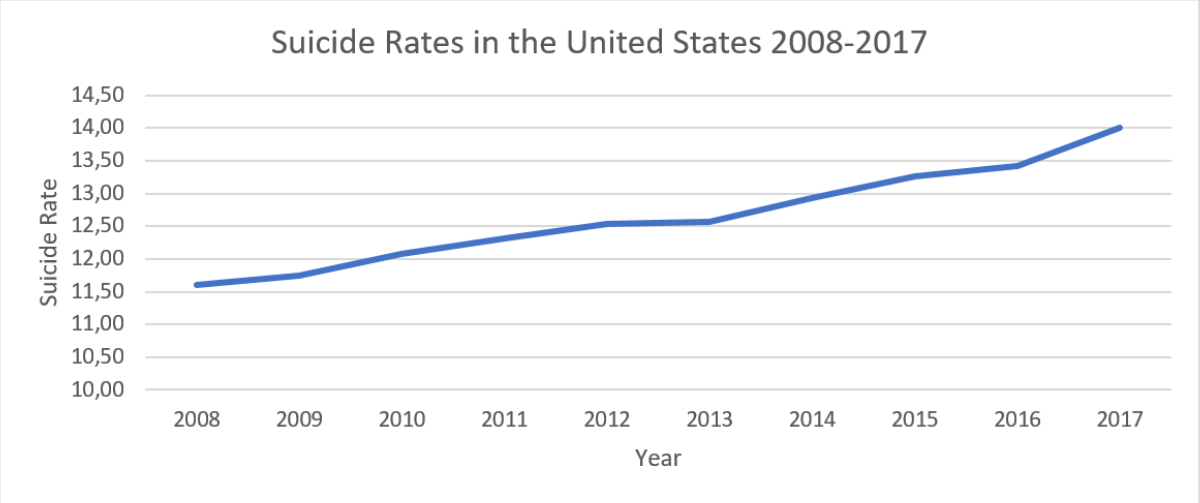

Figure 1. Suicide Rates in the United States 2008-2017 (CDC, 2017).

In turn, the number of homicides has not been growing but has remained high. In 2018, 15,498 people in the United States were murdered (CDC 2014). That equals to 42 individuals per day on average. Figure 2 presents the homicide rates in the United Stated over years 2008-2017.

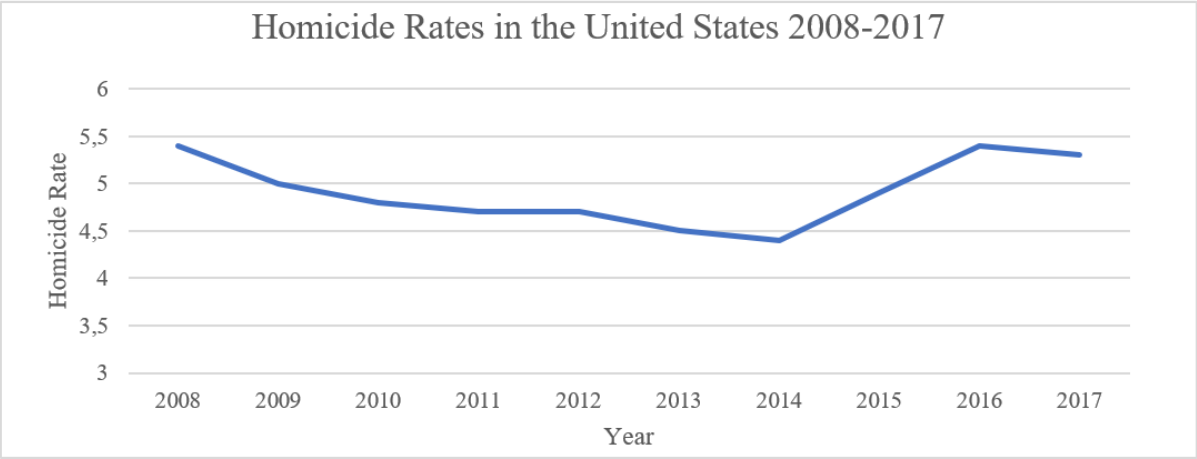

Figure 2. Homicide Rates in the United States 2008-2017, based on data from U.S. Department of Justice (n.d.)

Suicides and homicides entail costs not only for individual persons, but also for the entire society. Violent behavior has devastating effects on victims' families and friends, and especially on young children (World Health Organization, 2015). Intangible effects include among others anxiety, depression and problems at school or work (World Health Organization, 2015). Tangible effects include financial problems, especially if the victim was the main provider for the family (World Health Organization, 2015).

The economic loss to the society are related to medical and work-loss costs. According to the National Institute of Mental Health (2019), in 2013, suicides accounted for 24% and 12% of all medical and work-loss costs, respectively. According to 2010 data, one suicide generates $4,015 of medical costs per case and $1,160,484 costs for an employer (CDC 2014). In that year, 38,364 people committed suicide, which resulted in $44,674,827,000 costs for the entire U.S. economy. In turn, one homicide generates $10,944 of medical cost and work loss of $1,531,032 , which, with 14,722 deaths from homicide in 2010, translated into a $25,070,987,784 cost for the U.S. economy. Therefore, total economic cost of suicides is much higher than the cost of homicides for the U.S. economy, and this is due to the fact that suicides are 2.36 times as

frequent. Furthermore, The National Institute of Mental Health (2019) reports that, in 2017, 9,800,000 adults had serious thoughts about committing suicide, and 1,300,000 of them attempted a suicide. Considering the relatively steady homicide and ever-growing suicide rates, we can only expect both the intangible costs and the tangible costs to the society will be rising in the future, which is why this topic is of such a great importance.

C. Causes of Violent Behavior

It is crucial to understand the reasons for committing suicide and factors that increase the risk of those fatalities in order to prevent them. According to the Suicide Prevention Resource Center, there exist numerous factors that increase the suicide risk of an individual regardless of ethnicity, age, gender, etc. Those are, among others, depression or other mental disorders, social isolation, drug, alcohol abuse, disability, chronic illness, prior suicide attempts, having a family member or a friend that committed suicide, lack of access to mental health care and access to lethal means (SPRC, n.d.). Factors that decrease the risk of suicide include belonging to a community (i.e. family or social organization), having religious or cultural beliefs that discourage suicide, having high self-esteem, the ability to cope with problems, having a purpose in life, and access to mental health care (SPRC, n.d.).

Botelho and Gonçalves (2016) paper provide a summary of literature on factors influencing homicidal behavior. The four main factors that they extracted based on their research were physiological, developmental, psychopathological and social factors. Physiological factors comprise: biological (genetic, neurological) factors alone and in combination with the environmental factors and neuropathological – damage to brain areas associated with aggressive behavior. Developmental factors comprise the behavioral models that an individual learns during

childhood, such as exposure to violent behavior in the family as well as easy access to firearms, alcohol and drugs. Psychopathological factors: alcohol and psychoactive substance abuse increase the proneness to violent behavior; certain mental disorders can as well increase the risk. The most important social factors having an impact on homicide rates were unemployment, lack of opportunities, population density and social inequality.

D. The Role of Religion

There are many research papers on the influence of various factors on suicide, including religion. The topic has been of great interest for many years now, with one of the first papers on the subject published as early as in 1897 by Emile Durkheim, who found out that Protestants have higher suicide rates than Catholics (Lester, 2017). Modern research, such as Huang (1996), who studied suicide rates in 48 countries in 1990, found that in countries where the share of Catholic or Muslim population exceeded 85% of the total population, the suicide rates were significantly lower. According to a study by VanderWeele et al. (2016), which was conducted among 89,708 (mostly Catholic and Protestant) American women, those who frequently (at least once a week) attend religious services were five times less likely to commit suicide than those who never attend any such services. A research by Kleiman and Liu (2014) yielded similar results to the one by VanderWeele (2016): study participants who attended religious services at least 24 times a year were almost 70% less likely to commit suicide than others. A questionnaire study by Lester et al. (2017) revealed that among 419 American students, religiosity indeed can be a protective factor in individuals prone to suicide, but only among women of European descent.

The association between religiosity and crime is less clear. Shariff et al. (2012) compared data from the United Nations Office on Drugs and Crime's statistics on homicide and other crimes to data from World- and European Value Surveys from 67 countries. While they did not find any significant correlation between income inequality or poverty and crime rates, they established a strong negative association between belief in hell crime rates but a strong positive association between the belief in heaven and crime rates.

In a comparative perspective, various global studies show that religiosity has negative impact on suicide rates and a positive impact on homicide rates (e.g. Chon, 2015; Jensen, 2003). Jensen (2003) finds that the correlation between religiosity and homicide in the country is only valid in the case when the majority of a nation considers religion to be "of great importance" to them, and when the religion has a "good versus evil" understanding of morality. Jensen also notices that it is important to distinguish between different aspects of religiosity. He finds that higher integration in a religion has a negative impact both on suicide and homicide rates, whereas religious commitment increases homicide rates and decreases suicide rates. In the light of these findings, religion may be an important predictor of fatalities from violent behavior.

Therefore, there is need to study this topic with new methods in order to confirm or question the existing findings. Among the methods not yet applied to the study of the causal link between religiosity and death from violent behavior are the models developed by Bottan et al. (2015) and Gruber et al. (2008). The authors of the former examine how scandals caused by U.S. Catholic clergy influence religious participation and beliefs using an event-study design using the distribution of scandals over space and time. They find that even though Catholic clergy

abuse scandals have a negative impact on church attendance in the area where the scandal occurs, they do not seem to affect the religious beliefs.

Gruber et al. (2008), use the difference in differences design by measuring the impact of the repeal of "blue laws," or state laws prohibiting retail activity on Sunday, on church attendance levels and religious donations. They find a negative impact of the repeal of the laws on church attendance. The authors of both studies then use these findings to instrument for impacts of church attendance on various outcomes. Bottan et al. (2015) posit that the decrease in church attendance does not have a significant impact on pro-social behavior but decreases charitable contributions. Gruber et al. (2008) find that the decrease in church attendance has a positive effect on drinking and drug use. These two strategies could plausibly be applied to the study of other outcomes, such as suicides or homicides. For comparison, I also use variables for motor vehicle accidents and circulatory system fatalities.

2. Empirical Strategy

The first hypothesis of this paper is in accordance with the existing literature and states that that religiosity decreases suicide rates but increases homicide rates. The second hypothesis states that religiosity is not related to fatalities from causes other than violent behavior.

A. Specification

In order to test the hypotheses, I apply two fixed-effects regression models. For the regressions using clergy abuse scandals as an instrument, I follow Bottan et al. (2015)'s event-study model (with slight modifications in notation):

$$y_{i,t} = \alpha_{ST} S_{i,t}^{Short-Before} + \alpha_{LT} S_{i,t}^{Long-Before} + \alpha_{PS} S_{i,t}^{Short-After} + \boldsymbol{\beta} X_{i,t} + u_{i,t}$$

where y denotes a given fatality, i denotes a state or territory, t denotes a year, $S_{i,t}^{Short-Before}$ denotes the number of scandals that happened within three years before the given fatality (inclusive), $S_{i,t}^{Long-Before}$ denotes the number of scandals that happened between four and ten years before the given fatality (inclusive), $S_{i,t}^{Short-After}$ denotes the number of scandals that happened the first and the second year *after* the given fatality (as a falsification test), X denotes a vector of entity- and time-fixed effects, and u denotes the error term. The coefficients of interest are α_{ST}, and α_{LT}.

For the regressions using the "blue laws" and the "anti-evolution laws" as an instrument, I apply Gruber et al. (2007)'s difference in differences model (with modifications):

$$y_{i,t} = \gamma Laws_{i,t} + \boldsymbol{\beta} X_{i,t} + u_{i,t}$$

where y denotes a given fatality, i denotes a state or territory, t denotes a year, $Laws$ denotes whether the "blue laws" or "anti-evolution laws" are in place, X denotes a vector of entity- and time-fixed effects, and u denotes the error term. The coefficient of interest is γ. In both models, standard errors are clustered at the state level.

A disadvantage of using Bottan et al. (2015)'s model is that it scandals tend to mostly affect people living within the same zip code area where a scandal occurred, while I use state-level aggregates. An advantage, however, is that it takes the full sample size of 52 states, whereas for Gruber et al. (2008)'s model, the sample size is restricted to 16 states in the case of the "blue laws" and to nine states in the case of the "anti-evolution laws". This not only implies higher standard errors from a smaller number of observations, but may also entail selection bias. However, Gruber et al. (2008) argue that the sample of 16 countries is relatively representative

of the country and that the time of law repeal is random. In addition, an advantage of this model is that the effects are potentially spread out within a state. Similarly, the timing of the changes in the "anti-evolution laws" was also random, and the effects of the changes were evenly distributed within a state.

B. Assumptions and Caveats

Before proceeding to analysis, it is worth presenting assumptions and acknowledging the weaknesses of this setup. First, a potential threat to internal validity of my analysis is the lack of controls for time-varying changes within each state or territory. For example, unemployment rate or inequality may change over time just for a given state and thus the rate of suicides or homicides may increase. However, conditional on the validity of the instruments, this is a rather minor concern.

Nonetheless, the quality of the instruments is limited in terms of both relevance and validity. I rely on the relevance of the instruments as it is found in their sources, and I do not verify whether clergy abuse scandals, "blue laws", or "anti-evolution laws" are strongly correlated with religiosity. Furthermore, I follow the assumption that there is no other way these instruments may impact fatality rates than through the change in religiosity. This is because I consider these outcome variables analogous to variables such as risky behavior measures (*Drinking, Marihuana, Cocaine)* from Gruber et al. (2008).

One important violation of clergy abuse scandals as an instrument is that the scandals may have a direct effect on suicide rates, especially among the abuse victims and their families. However, suicides are more likely to happen soon after the abuse rather than soon after a scandal, which often happens much later (Bottan et al. 2015). Another violation is the potential

demoralizing effect of these scandals, which may reduce moral standards, but not decrease religiosity, in the individuals who later commit homicide. A third potential violation to this instrument is related to motor vehicle accidents, which may happen as a result of stress related to the scandals but not to religiosity per se. Moreover, the scandals have been shown to reduce employment (Bottan et al. 2015), which may translate into a higher rate of suicides. A potential violation to the "anti-evolution laws" instrument is that the repeal of these laws may increase trust in science and thus induce individuals to follow health indications. However, I assume that all these effects are relatively weak and thus the primary channel through which they affect the outcomes of interest is religiosity. Therefore, in my regression analysis, I assume that significant coefficients on the instruments indicate significant relationship of religiosity with the target variable and I interpret the results from this perspective.[1]

[1] Note that the sign on the assumed coefficients for *religiosity* is concurrent with the ones for *blue laws* and *anti-evolution laws* but opposite to the one for *scandals.*

3. Data

The full dataset comprises years 1968-2016 and all 52 U.S states and territories. There are four dependent variables and three independent variables of interest. The numbers of observations, means, standard deviations, and minimum and maximum values of the indicators are summarized in Table 1.

Table 1: Summary Statistics

VARIABLES	(1) N	(2) MEAN	(3) SE	(4) MIN	(5) MAX
number of scandals at the year of fatality	2,576	1.15	5.39	0	110
number of scandals up to 3 years before fatality	2,576	4.43	15.42	0	192
number of scandals between 4 and 10 years before fatality	2,576	7.30	22.91	0	238
number of scandals up to 2 years after fatality	2,576	2.27	9.19	0	170
log number of scandals up to 3 years before fatality	2,576	0.93	3.24	0	42.7
log number of scandals between 4 and 10 years before fatality	2,576	11.6	16.30	0	89.0
log number of scandals up to 2 years after fatality	2,576	0.47	2.02	0	38.0
number of suicides	2,576	516	630.77	0	4,234
number of homicides	2,576	331	498.87	0	4,140
number of motor vehicle fatalities	2,576	780	893.22	0	6,017
number of circulatory system disease fatalities	2,576	21,899	45283.06	0	938,150
log of the number of suicides	2,576	54.6	46.63	0	269
log of the number of homicides	2,576	28.4	33.44	0	213
log of the number of motor vehicle fatalities	2,576	84.7	75.21	0	461
log of the number of circulatory system disease fatalities	2,576	283	212.76	0	1,681

Notes: The full number of states and territories: 52. Years: 1968-2016. Number of states that repealed "blue laws": 16. Number of states that repealed "anti-evolution laws": 9. Sources: Center for Disease Control and Prevention (CDC Wonder: Compressed Mortality Data); Bottan et al. (2015); Gruber et al. (2008).

The dependent variables related to violent behavior are the *suicide*s and *homicides*. The dependent variables non-related to violent behavior are fatalities from motor vehicle accidents (*accidents)* and from circulatory system diseases (*diseases).* All these variables are from the CDC dataset and are measured as numbers in a given state or territory in a given year. The independent variables are instruments for religiosity: the number of sexual abuse scandals involving Catholic clergy in a given state or territory in a given year (*scandals)* and two binary variables indicating zero for and since the year of the repeal of the "blue laws" *(blue laws)* or

"anti-evolution laws" *(anti-evolution laws)* in a given state or territory.[2] The data on clergy scandals comes from Bottan et al. (2015) research paper, the data on the "blue laws"—from Table 1 in Gruber et al. (2008, p. 30), and the data on the "anti-evolution laws"—from Wheaton (2019).

4. Results

Table II shows the results from fixed-effects regressions of clergy abuse scandals, here interpreted as an inverse of religiosity, on the four outcome variables of interest. The strong negative coefficient on the number of suicides in the short term suggests that decreased religiosity reduces the number of suicides, which is contrary to the existing literature. However,

Table II: Effects of Sexual Abuse Scandals on Fatalities (Panel Data, Basic)

	(1)	(2)	(3)	(4)
VARIABLES	*suicides*	*homicides*	*accidents*	*disease*
scandals, short before	-1.171***	-1.380	-1.874***	-43.03**
	(0.384)	(1.130)	(0.640)	(17.70)
scandals, long before	0.553	-2.605***	-5.193***	-91.47***
	(0.500)	(0.945)	(1.322)	(24.12)
scandals, short after	-2.428**	0.538	-3.209***	-28.97
	(1.016)	(0.953)	(0.861)	(25.93)
Constant	416.8***	296.3***	1,096***	20,821***
	(30.85)	(28.44)	(46.22)	(963.6)
Observations	2,489	2,489	2,489	2,489
R-squared	0.310	0.254	0.544	0.388
Number of stateid	51	51	51	51

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
State fixed effects: yes. Year fixed effects: yes.
Note: Based on data from 52 U.S. states and territories for years 1968-2016, aggregated at the state level. Dependent variables: *suicides* indicates the number of suicides; *homicides* indicates the number of homicides; *accidents* indicates the number of fatalities from motor vehicle accidents; *disease* indicates the number of fatalities from circulatory system diseases. Independent variables: *scandals, short before* indicates the number of scandals up to three years before the fatality; *scandals, long before* indicates the number of scandals four to ten years before the fatality, inclusive; *scandals, short after* is a falsification check indicating the number of scandals one and two years before the fatality.

[2] As in Bottan et al. (2015), a "scandal" refers to media coverage of an alleged abuse and not to its actual occurrence.

this effect loses its significance in the long term. The decrease in the number of homicides for a decrease in religiosity in the long run, as suggested by Column 2, is consistent with the hypothesis. However, a strong increase in motor vehicle accidents and circulatory system diseases from religiosity is a less expected outcome. Moreover, this instrument does not pass the falsification test on any of the indicators, which implies that this series of regressions is inconclusive.

Table III presents findings from fixed-effects regressions on the outcomes in 16 states where the "blue laws" were repealed at some point. None of the coefficients turns out to be significant at any conventional confidence level, and only the increase in the number of homicides seems to confirm the hypothesis. Table IV uses an analogous instrument for the nine states that repealed their "anti-evolution laws". From the two statistically significant coefficients on *suicides* and *disease*, the former outcome is intuitive and suggests that religiosity has a strong

Table III: Effects of "Blue Laws" on Fatalities (Panel Data, Basic)

VARIABLES	(1) *suicides*	(2) *homicides*	(3) *accidents*	(4) *disease*
blue laws in place	45.82	66.95	90.42	914.2
	(118.3)	(70.65)	(133.0)	(2,256)
Constant	451.0**	265.3***	1,198***	22,592***
	(161.5)	(79.19)	(171.4)	(3,261)
Observations	784	784	784	784
R-squared	0.297	0.273	0.473	0.155
Number of stateid	16	16	16	16

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
State fixed effects: yes. Year fixed effects: yes.
Note: Based on data from 52 U.S. states and territories for years 1968-2016, aggregated at the state level. Dependent variables: *suicides* indicates the number of suicides; *homicides* indicates the number of homicides; *accidents* indicates the number of fatalities from motor vehicle accidents; *disease* indicates the number of fatalities from circulatory system diseases. Independent variable: *blue laws in place* is a binary variable with the value of 1 for the years when the "blue laws" were in place

Table IV: Effects of "Anti-Evolution Laws" on Fatalities (Panel Data, Basic)

VARIABLES	(1) *suicides*	(2) *homicides*	(3) *accidents*	(4) *disease*
anti-evolution laws in place	-683.0***	-12.64	-414.9	-6,209***
	(114.7)	(34.85)	(267.9)	(1,470)
Observations	441	441	441	441
R-squared	0.643	0.352	0.416	0.413
Number of stateid	9	9	9	9

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
State fixed effects: yes. Year fixed effects: yes.
Note: Based on data from 52 U.S. states and territories for years 1968-2016, aggregated at the state level. Dependent variables: *suicides* indicates the number of suicides; *homicides* indicates the number of homicides; *accidents* indicates the number of fatalities from motor vehicle accidents; *disease* indicates the number of fatalities from circulatory system diseases. Independent variable: *anti-evolution laws in place* is a binary variable with the value of 1 for the years when the "anti-evolution laws" were in place.

negative impact on suicide rates. The latter outcome, which is less expected, indicates that religiosity is a strong predictor of a reduced number of deaths from circulatory system diseases. The other two coefficients are not certain.

The results from fixed-effects regressions on the three instruments pose an interpretation challenge. None of the coefficients is consistent in terms of its sign or significance level. Considering only the statistically significant results, higher religiosity increases suicides if measured by the abuse scandals but decreases them if measured by the "anti-evolution laws". This measure of religiosity does not seem to have any impact on homicides. It may, however, increase the number of motor vehicle fatalities. It may also increase or decrease the number of circulatory system diseases, for clergy abuse scandals or for the "anti-evolution laws", respectively.

This discrepancy of results calls for an improvement in specification. The test for skewness and kurtosis rejected the normality of all variables related to fatalities and to scandals. Therefore, I replace each of them by its logarithmic transformation and report the results in Tables V-VII. Table V reports the results from the enhanced regressions for the Bottan et al. (2015)'s model. Although none of the coefficients is significant, the signs for the *log suicide* and *log homicide* dependent variables on the *log scandals, long before* regressor are now consistent with the perspective that religiosity decreases suicide rates and increases homicide rates in the long run. Table VI also does not suggest any relationship of interest to be significant. The coefficient for suicides is contrary the view that religiosity decreases suicide, but the coefficient on homicides is again consistent with the existing literature. Finally, the improved estimation for

Table V: Effects of Sexual Abuse Scandals on Fatalities (Panel Data Logarithmic Transformation)

VARIABLES	(1) *log suicides*	(2) *log homicides*	(3) *log accidents*	(4) *log disease*
log scandals, short before	-0.00896	-0.0117	0.0215	-0.000208
	(0.0131)	(0.0265)	(0.0185)	(0.0107)
log scandals, long before	-0.00113	0.0118	0.00762	-0.00446
	(0.0142)	(0.0338)	(0.0212)	(0.0106)
log scandals, short after	-0.00106	0.00484	0.0114	0.00588
	(0.0112)	(0.0114)	(0.0103)	(0.00664)
Observations	476	476	476	476
R-squared	0.508	0.432	0.425	0.441
Number of stateid	44	44	44	44

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
State fixed effects: yes. Year fixed effects: yes.
Note: Based on data from 52 U.S. states and territories for years 1968-2016, aggregated at the state level. Dependent variables: *log suicides* indicates the logged number of suicides; *log homicides* indicates the logged number of homicides; *log accidents* indicates the logged number of fatalities from motor vehicle accidents; *log disease* indicates the logged number of fatalities from circulatory system diseases. Independent variables: *log scandals, short before* indicates the logged number of scandals up to three years before the fatality; *log scandals, long before* indicates the logged number of scandals four to ten years before the fatality, inclusive; *log scandals, short after* is a falsification check indicating the logged number of scandals one and two years before the fatality.

Table VI: Effects of "Blue Laws" on Fatalities (Panel Data, Logarithmic Transformation)

VARIABLES	(1) *log suicides*	(2) *log homicides*	(3) *log accidents*	(4) *log disease*
blue laws in place	0.0990	0.00737	0.132	0.0227
	(0.179)	(0.128)	(0.243)	(0.0781)
Observations	781	695	779	784
R-squared	0.384	0.499	0.554	0.422
Number of stateid	16	16	16	16

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
State fixed effects: yes. Year fixed effects: yes.
Note: Based on data from 52 U.S. states and territories for years 1968-2016, aggregated at the state level. Dependent variables: *log suicides* indicates the logged number of suicides; *log homicides* indicates the logged number of homicides; *log accidents* indicates the logged number of fatalities from motor vehicle accidents; *log disease* indicates the logged number of fatalities from circulatory system diseases. Independent variable: *blue laws in place* is a binary variable with the value of 1 for the years when the "blue laws" were in place.

the "anti-evolution laws" in Table VII reports some unexpected results, all of which are statistically significant. According the outcomes, the decrease in religiosity from the repeal of "anti-evolution laws" causes about 34% more suicides, 26% more homicides as well as 29% more deaths from motor vehicle accidents and 16% more deaths from circulatory system diseases. In terms of the signs of the estimates, these results are consistent with those for the corresponding regressions from Table IV. Only the effect on suicides confirms one the

Table VII: Effects of "anti-evolution laws" on Fatalities (Panel Data Logarithmic Transformation)

VARIABLES	(1) *log suicides*	(2) *log homicides*	(3) *log accidents*	(4) *log disease*
anti-evolution laws in place	-0.339***	-0.260**	-0.286***	-0.160***
	(0.0613)	(0.102)	(0.0815)	(0.0409)
Observations	441	441	441	441
R-squared	0.618	0.675	0.699	0.509
Number of stateid	9	9	9	9

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
State fixed effects: yes. Year fixed effects: yes.
Note: Based on data from 52 U.S. states and territories for years 1968-2016, aggregated at the state level. Dependent variables: *log suicides* indicates the logged number of suicides; *log homicides* indicates the logged number of homicides; *log accidents* indicates the logged number of fatalities from motor vehicle accidents; *log disease* indicates the logged number of fatalities from circulatory system diseases. Independent variable: *anti-evolution laws in place* is a binary variable with the value of 1 for the years when the "anti-evolution laws" were in place.

hypotheses of the paper, while the rest of the results are surprising. However, these estimates may be less reliable than those for the other instruments due to a narrower selection of states and thus a smaller number of observations.

5. Discussion

While the effect on suicides is consistent with the first hypothesis of this paper, the positive effects on homicides, car accidents, and circulatory system diseases question both hypotheses. If fatalities nonrelated to violent behavior are considered as placebo variables, these outcomes may reveal some endogeneity issues in the specification. If the former is the case, one possibility is that some time-varying local factors in some of the states had impact on both the anti-evolution laws and the four dependent variables. For example, the prior secularization of the nine states could have made them more likely to repeal the "anti-evolution laws" and exhibit the effects observed. However, the exact timing of a legislative decision does not seem to have depended only on the level of secularization. Another possibility is that the "anti-evolution laws" are a weak instrument, for example because it could have been the belief in evolution per se or trust in science that contributed to some of the outcomes, holding religiosity constant. Arguably, however, it would not be the case for all of the outcomes.

Assuming, however, the validity of these findings, they have some interesting implications. One question to examine is whether the repeal of the "anti-evolution laws" affects religiosity in a different way than the other instruments. Consider that the "blue laws" target church attendance rather than belief and that the clergy abuse scandals have been shown to cause change also only in church attendance (Bottan et al. 2015), whereas the "anti-evolution laws"

impact belief (Wheaton 2019) likely for lifetime, due to the importance of education and young age in forming personal beliefs, including religious values.

These values may have a large influence on the attitude toward suicide, killing as well as driving style, nutrition habits, and stimulants use. Christianity prohibits drug use as well as excessive alcohol consumption and smoking (e.g. Catechism of the Catholic Church 2290). In turn, alcohol and drug addiction are factors that decrease both short-term and long-term capability (Petridou and Moustaki, 2000). Christianity also promotes respect to the law (e.g. Romans 13:1-6 Revised Standard Version), which includes traffic law. These are two channels through which religiosity may decrease the number of motor vehicle fatalities. In addition to the prohibition of stimulants use, religions often encourage healthy lifestyle (e.g. gluttony as a sin in Christianity or yoga as part of spirituality in Hinduism and Buddhism). As smoking, high body mass, and the lack of physical activity are risk factors of circulatory diseases (American Heart Association, 2017), following a religion may improve the health outcomes.

Assuming this interpretation, these findings suggest that while religiosity in the form of church attendance may have no impact on the extreme forms of violent or risky behavior, religious beliefs indeed are a strong predictor thereof. Alternatively, by itself, either indicator of religiosity may deter violent and risky behavior to a certain degree, but church attendance may also impact some non-religious factors that cause bias on the results, such support for gun ownership or social drinking. In turn, gun ownership may increase the likelihood of suicide and homicide, and social drinking may cause drunk driving.

Another possibility to explain the heterogeneity of outcomes for these types of instruments is selection. The “blue laws” affect almost all Christians, the clergy abuse scandals mostly affect Catholics, and the “anti-evolution laws” mostly affect Protestants of certain

denominations. In this context, the outcomes found using this instrumental variable directly apply only to the religious groups that deny the theory of evolution. Such groups, in turn, may be more radical in following religious precepts, and thus the same change in beliefs may have a stronger effect on the observed outcomes. This heterogeneity of effects depending on denomination may be an interesting topic for further study.

Further research could consider interactions between religion and different demographic groups. For example, in 2017, the suicide rate was highest among Whites (15.85) followed by American Indians and Alaska Natives (13.42). Regarding age, the highest suicide rate was found among the group 45-54 (20.2). As of 2012, 88.1% of homicide offenders were male (U.S. Department of Justice, 2017). Perhaps, for the same level of declared religiosity, these groups differ in how their approach to religion, thus having different outcomes.

6. Conclusion

In this paper, I have employed three instrumental variables to estimate the influence of religiosity on suicide and homicide as compared to its influence on motor vehicle accident fatalities and circulatory system disease fatalities. I used panel data from 52 U.S. states and territories in the time period 1968-2016. After a series of ambiguous results, I improved my specification by using logarithmic transformation of the non-binary variables. From among the new series of regressions, only one of the instrumental variables, namely the “anti-evolution laws,” obtained statistically significant coefficients. This heterogeneity of outcomes may suggest that religious beliefs are a stronger predictor of reduced lethal outcomes than church attendance. If this is the case, the weakening of religious beliefs not only increases not only the number of suicides, but also the number of deaths from homicides, motor vehicle accidents, and circulatory

system diseases. The reduction in suicide by increased religiosity is consistent with the existing literature, but the reduction in homicide questions findings of authors such as Chon (2015) or Jensen (2003). The impact of religiosity on the variables non-related to violent behavior is surprising but may be associated with the impact of religion on risky behavior and health choices. Finally, It is important to acknowledge that this paper is a study from the United States in the time period 1968-2016 only, and the results may or may not be valid for countries with other characteristics, such as religious structure or level of income.

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