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Instrumental variable estimation of the effect of prayer on depression

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ABSTRACT

This paper uses a cross-country representative sample of Europeans over the age of 50 to analyse whether individuals' religiosity is associated with higher levels of well-being as a large number of studies by mental health researchers and economists have suggested. It is shown that in simple models which take no account of possible simultaneity that religiosity, as measured by the frequency of prayer, is associated with a higher level of depression. To circumvent possible reverse causality, the paper utilises a quasi-experimental/instrumental variable design which allows one to interpret the findings as causal. This leads to the conclusion that prayer has a positive effect i.e. it leads to a lower level of depressive symptoms.

Introduction

There is a significant body of research examining the association between people's mental health and their religious beliefs and practices. This paper contributes to this literature by asking whether frequency of prayer leads to individuals being less susceptible to depression. It differs from the bulk of the literature in that it claims, given certain assumptions, to identify a causal effect of prayer and not simply a statistical association.

A meta-analysis by Smith, McCullough, and Poll (2003) of 147 studies concluded that there was a small but reliable negative association between religiousness and depressive symptoms with an average effect size of −.096. They discuss possible mechanisms by which religion might affect mental health and well-being generally. One is that religion may cause individuals to avoid harmful behaviour such as the excessive consumption of drugs or alcohol. A second is that religion may provide some social support to an individual that may be protective against depression and other affective disorders. Alternatively, religion may act as an emotional resource to individuals in dealing with stressors. They note that the measure of religiousness matters with extrinsic religion (religion as a means to gain solace or status or something as opposed to intrinsic religion where belief is an end in itself) being *positively* associated with depressive symptoms. A related question, not considered here, is the effect of religion on measures of happiness or life satisfaction for example Clark and Lelkes (2006). Note that a positive association between religion and depression could be caused by reverse causality whereby being depressed induces greater religiosity.

A feature of all the papers in this literature is their reliance on either bivariate comparisons or single equation multivariate techniques such as ordinary least squares regression (OLS) or its limited dependent variable analogues such as logistic regression. Thus they provide estimates of statistical association but there are good arguments that one is not measuring the *effect of religion*. There are two obvious reasons why the association between religion and well-being might not be causal, confounding, whereby the religion variable is at least partly picking up the effect of some omitted variable (for example personality) and reverse causality, whereby causation runs in the other direction from well-being to religion.

Both possibilities manifest themselves as a correlation between the disturbance term and the covariate in question and hence conventional estimators such as regression will generate biased and inconsistent estimates. In the absence of random assignment of people to religion, there is no easy way round this. The extent to which this is a problem is unclear: most people's religion is that of their parents so it is effectively assigned to them exogenously. However, those who change from the religion of their upbringing are unlikely to do so randomly.

Despite the extensive literature on this topic, the literature is at quite an early stage because of the difficulty in confronting the basic question of causality. So progress needs to occur both from collecting much better data and from methodological developments.

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This paper seeks to contribute to the latter by using an estimation strategy widely used in econometrics for dealing with these problems, instrumental variable estimation.

Data and methods

Data

The dataset used is SHARE: the Survey of Ageing, Health and Retirement in Europe, see Boersch-Supan and Juerges (2005). This collects data from nationally representative samples of the non-institutional population aged 50 years and older. The primary sampling unit is a household and all individuals in the household in the target age category are interviewed. This paper used release 2 of Wave 1 of the dataset which includes 11 countries which was collected between 2004 and 2006. The countries are: Austria, Belgium, Denmark, Greece, Germany, Italy, Israel, Netherlands, Spain, Sweden and Switzerland. Since this is secondary data analysis, no ethical approval was sought.

The dependent variable, Euro-D, is a scale created to provide a simple measure of the extent of depressive symptoms amongst older populations that could be used for comparing across European countries. This is a 12 item scale developed by the EURODEP Consortium (Copeland, 1999; Prince et al., 1999). The items are a subset of those on the Geriatric Mental Scale. It is not a diagnostic measure. The 12 items referred to are: sadness, pessimism, wishing to be dead, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness. The questions refer to the presence of these symptoms in the last month so for example respondents were asked "Have you had too little energy?" and "Have you cried at all?" Each question is answered by either "Yes" or "No" and the total score is the number of "yes" answers. For convenience, this variable will be simply referred to as "depression". An individual with a Euro-D score greater than 3 is considered to be at risk of depression. It is not usual to analyse individual items in such a scale since each question would be insufficient to identify a particular problem. Other analyses of the depression data in SHARE include Castro-Costa et al. (2007) and Denny (2008).

The data contains three questions on religion. Respondents were asked how often they prayed using six possible frequencies. I recode this into a "prayer" variable, equal to one if they report praying daily, almost daily or more often (& equal to zero otherwise). Respondents are asked what their religious affiliation was. The responses were coded into seven categories. From this variable I create a variable ("Believer") which is equal to one if one of the denominations (i.e. any of the first six categories) is indicated and is equal to zero if "none" is chosen. However the "none"s are not interpreted as either atheists or agnostics. They may simply not belong to a particular denomination. That some of those answering "none" also report a positive frequency of prayer is consistent with this. Finally, respondents were asked whether they were brought up religiously by their parents.

Table 1 gives the frequency distributions for the three religion questions in the data for the sample that was used in the empirical work. One can see that Protestants and Catholics account for 28.98% and 41.59% respectively of the sample. Table 2 provides means and standard deviations for the variables used in the models. Missing values were handled by case-wise deletion resulting in a sample of 14,822; no other selection criteria were applied.

Table 1
Frequency distributions for religion questions (model sample).

	Frequency	%
(a) "What religion do you belong to or feel attached to mostly?"		
Protestant	4296	28.98
Catholic	6165	41.59
Orthodox	1747	11.79
Jewish	39	0.26
Muslim	48	0.32
Other	270	1.82
None	2257	15.23
	14,822	100
(b)"About how often do you pray?"		
More than once a day	1630	11.00
Once daily or almost daily	2705	18.25
A couple of times a week	1549	10.45
Once a week	1105	7.46
Less than once a week	2962	19.98
Never	4871	32.86
	14,822	100
(c) "Have you been educated religiously by your parents?"		
Yes	10,987	74.13
No	3835	25.87
	14,822	100

Methods

This paper differs sharply from the existing papers in how it approaches causality. The existing literature uses cross-sectional or longitudinal datasets to measure associations between some measure of mental health or well-being and one or more measures of religiosity along with some controls. There is no guarantee that this captures a measure of the effect of religiosity on the outcome. There are two possible alternative scenarios (i) *reverse causality* (or endogeneity/simultaneity) whereby it is mental health that is causing the religious outcome and (ii) *confounding* whereby the observed association reflects a correlation of both religion and mental health with some unmeasured characteristic. In the first case, it is plausible that people who are depressed might become more religious as a result. In the second case, one can easily think of omitted variables that could generate such an association such as personality. And while one may be able to control for some of the more obvious variables (such as education) one cannot be sure that one has included all possible confounders.

It is difficult to see how a randomised control trial could be implemented in the present context. Some researchers in this field have sought to address the problem of inferring causality by using longitudinal data. The basic argument is that by comparing changes

Table 2
Descriptive statistics for sample used in models.

	Mean	Std deviation
Euro-D	2.064	2.094
Prayer	.292	.453
Religious education	.741	.447
Believer	.848	.351
Religious education × Verbal ability	14.022	10.256
Woman	.545	.498
Age	63.151	10.094
Age squared/100	40.901	13.259
Divorced/separated	.074	.261
Never married	.053	.224
Widowed	.125	.331
GALI limitations	.391	.488
Income (€10,000s 2004 prices)	2.482	.348
No income	.091	.287
Employed	.318	.466
Unemployed	.032	.177
Home maker	.150	.357
Years of education	11.084	3.644
Numeracy	3.522	1.066
Verbal ability	19.724	7.120
Suburbs of big city	.190	.389
Large town	.208	.407
Small town	.252	.424
Village/rural area	.203	.394

$N = 14{,}822$.