A Monetary Valuation of Individual Religious Behavior: The Case of Prayer

Working Paper

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Abstract**:** The majority of the U.S. population is religious. However, individuals vary quite significantly in the degree to which their religious faith expresses itself in religious behavior. The degree to which individuals value their religious faith can be inferred from the degree to which they value their religious behavior. The value of a fundamental religious behavior, prayer, is determined using the well-being valuation method. Theoretically appropriate instrumental variables are used to avoid bias in estimating of the effects of family income and the frequency of prayer on well-being. The marginal value of an additional weekly prayer session for individuals already at the national mean is estimated to be $11,000 per annum (2004 dollars). Praying at the frequency of the national mean of 8.1 prayer sessions weekly is valued at $89,100 (2004 dollars) per annum. This suggests that the perception of communion with God is highly valued by religious individuals.

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I. INTRODUCTION

Economists have long been studying religious behavior including financial contributions to religious groups, the economic effects of religion for individuals, competition between the religious groups that form the religious market place, the behavior of religious organizations, attendance at religious services, the association between religiosity and happiness, and prayer (e.g., Azzi and Ehrenberg, 1975; Iannaccone, 1998; Cameron, 1999; Clain and Zech, 1999; Branas-Garza and Neumann, 2004; Soydemir *et al*., 2004; Gruber, 2004, 2005; Gruber and Hungerman, 2006; Tao, 2008; Brown, 2009). However, to date, no one has attempted to perform a monetary valuation of the individual religious activity of prayer.

Why put a monetary value on prayer? According to the General Social Survey, 85.7% of the U.S. population self-identified as religious to some extent as of 2004. However, only 78.5% of the U.S. population prays at least once per week. While other proxies of religious commitment are possible, prayer is a relatively pure indicator of personal commitment to a given religious faith. Devout believers perceive prayer as one of the primary ways by which the believer receives benefits from God. Thus, how often a person prays is one indication of their level of commitment to a given religious tradition. The degree to which a person believes that they will receive benefit from praying is the degree to which that person will be willing to bear a given opportunity cost (Brown, 2009).

As Brown (2009) points out, relative to the frequency of prayer, attending religious services and charitable giving to religious groups are weaker indicators of religious commitment. Individuals who give little credence to a given religious tradition may still attend religious services for their social benefits, such as social support and mutual aid (Hull

and Bold, 1989). In addition, such individuals may also contribute to religious organizations for the social status and organizational influence that such contributions bring (Iannaccone, 1997). These types of individuals will tend to pray infrequently (if at all), perhaps only in public gatherings where they can gain the social benefits available from public prayer.

Attaching a monetary value to a religious activity such as prayer can give us some sense, using a common metric, of the value of such religious activity to individuals. One way to conduct such a valuation is the well-being valuation method, also called the life satisfaction approach.

The well-being valuation method has been widely used by economists to value a wide variety of non-market goods and services (Di Tella and McCullough, 2006). In environmental economics it has been applied to value local environmental characteristics such as noise (van Praag and Baarsma, 2005), air pollution (Welsch, 2002; 2006; Luechinger, 2009; MacKerron and Mourato, 2009), climate (Brereton *et al*., 2008), flood disasters (Luechinger and Raschky, 2009), droughts (Carroll *et al*., 2009), and proximity to waste facilities, coastlines, and major transportation routes (Brereton, *et al*., 2008). In the economics of crime it has been used to value crime (Cohen, 2008), the fear of crime (Moore, 2006), corruption (Welsch, 2008a), civil conflict (Welsch, 2008b), and terrorism (Frey *et al*., 2009). In health economics it been used to value various types of illness (Ferrer-i-Carbonell and van Praag, 2002), public health care (Kotakorpi and Laamanen, 2008), and informal care (van den Berg and Ferrer-i-Carbonell, 2007). It has also been used to value aspects of relationships such as trust in the workplace (Helliwell, 2006), and interpersonal relationships themselves (Stanca, 2009). In macroeconomics, it has been used to value the tradeoff between unemployment and inflation (Di Tella *et al*., 2001).

In this paper, we use the well-being valuation method to estimate the monetary value of prayer in the U.S over a nine-year period. We account for potential omitted variable bias,

measurement error and endogeneity with respect to the relationship between happiness and our two key variables of interest: the frequency of prayer and family income.

II. THE WELL-BEING VALUATION METHOD

The well-being valuation method assumes that individuals are rational utility maximizers. The basic procedure is to empirically estimate indifference curves using a measure of experienced utility (e.g., happiness, life satisfaction). When income is included in the indifference curve measure it is then possible to determine the amount of money that could be exchanged for any other good in the equation such that the average individual would be just as well off. Given the following utility function:

$$v = v(x, y, z) \tag{1}$$

where v is a measure of utility, x is any good that we wish to evaluate, y is income, and z is a set of control variables, the marginal rate of substitution is simply

$$\frac{\partial y}{\partial x} = -\frac{\frac{\partial v}{\partial x}}{\frac{\partial v}{\partial y}} \tag{2}$$

Implementing this approach raises a series of issues regarding measurement. First, most happiness/life satisfaction scales are ordinal in nature. While this is sufficient, since the marginal rate of substitution is an ordinal concept, it has been found that assuming such measures are cardinal makes little difference in empirical results (Ferrer-i-Carbonell and Frijters, 2004). This finding has been repeated by van den Berg and Ferrer-i-Carbonell (2007), Brereton *et al*. (2008), Frey *et al*. (2009), Oswald and Powdthavee (2008), Luechinger and Raschky (2009), MacKerron and Mourato (2009), and others. In fact, many studies only use ordinary or generalized least squares (e.g., Moore, 2006; Luechinger, 2009; Powdthavee, 2009).

Second, for measures of happiness/life satisfaction to be useful in research, they must be valid, reliable, and consistent. These characteristics have been extensively researched and have found to be adequate (Frey and Stutzer, 2002).

Finally, the adaptive nature of human happiness/life satisfaction must to be taken into account in any research using happiness/life satisfaction measures. Psychologists have noted that individuals adapt to new situations/goods over time, such that the happiness they experience due to a given good or situation in the long-run is often lower than in the short-run. This is known as the *hedonic treadmill* (Kahneman and Sugden, 2005).

III. DATA AND ECONOMETRICS

The data used in this analysis comes from the 1996, 1998, 2000, 2002, and 2004 General Social Survey (GSS). The GSS is a survey administered to adults 18 years of age and older in the U.S. by the National Opinion Research Center. The equation to be estimated is specified as follows:

$$\ln H_i = \beta_0 + \beta_1 P_i + \beta_2 Y_i + \beta_3 D_i + \beta_4 T + \varepsilon_i \qquad (3)$$

where H_i is measured as the natural logarithm of a three-level variable where individuals answered the question, “Taken all together, how would you say things are these days--would you say that you are very happy, pretty happy, or not too happy?”, and happiness is scaled from one to three where “not too happy” is one and “very happy” is three.

The weekly frequency of prayer, P_i, is coded as follows: never (zero), less than once a week (zero), once a week (one), several times a week (three), once a day, (seven) and several times per day (21). Family income, Y_i, is a continuous measure that is top coded at $999,999. The vector, D_i, contains demographic information including sex, (male, female), age (18-24,

25-34, 35-44, 45-54, 55-64, 65-74, 75 and older), race (white, black, other race), marital status (single, married, divorced/separated, widowed), and education (less than high school, high school graduate or equivalent, some college or an associate's degree, bachelor's degree, graduate school). The vector, *T*, contains year dummies. Finally, ε_i is the error term. The reference group is male, aged 18-25, white, single, does not pray, has zero family income, has less than a high school education, and responded to the GSS in 1996.

Positive signs are expected for both β_1 and β_2. However, the above specification is subject to two important limitations that must be corrected for econometrically. First, there are obviously many omitted variables that may affect our two main parameters of interest, β_1 (prayer) and β_2 (family income), resulting in omitted variable bias. This includes any measures of income adaptation that may occur over time. Second, there is the issue of endogeneity. Many religious individuals who are unhappy may, as a result, pray more, resulting in a negative bias to estimates of β_1. Similarly, happier individuals may be more effective in their careers and thus earn more money resulting in a positive bias to estimates of β_2.

Both of these potential problems can be addressed using the instrumental variable approach incorporating theoretically appropriate instrumental variables. With regard to correcting for omitted variable bias and endogeneity with respect to income in happiness equations, Powdthavee (2009) has found that that corrected estimates are twice as large as uncorrected estimates suggesting that potential endogeneity and omitted variables bias are substantial problems. Two variables are used here that are unlikely to correlate with the error term of equation (3) but highly likely to correlate with the family income of the respondent. These are the General Social Survey/National Opinion Research Center (GSS/NORC) prestige score for the occupation of the respondent's father and occupation of the

respondent's spouse (Nakao and Treas, 1994). For individuals with no spouse or who had no father while growing up, the prestige score is coded zero

Two variables are also used to predict the frequency of prayer that are also unlikely to correlate with the error term of equation (3). These are whether the respondent had a moderate religious upbringing (as opposed to a liberal or moderate religious upbringing) and the number of per capita employees employed in religious organizations in the respondent's state in the previous year as described by the religious portion of the Petris Social Capital Index (PSCI) lagged by two years. Both of these variables have been found to correlate with the frequency of prayer in previous research (Brown, 2009). The religious portion of the PSCI is a proxy for the density of religiosity in a given state and has been used in other types of economic analysis where it has been described in detail (Brown *et al*., 2006). Descriptive statistics are presented in Table 1.

Equation (3) is estimated using limited information maximum likelihood (LIML). The strength of the set of instruments used to correct the potential bias in the potentially endogenous variables is tested using the criteria developed by Stock and Yogo (2005) for LIML estimators. Hansen's *J* test is computed to test the exogeneity of the overidentifying instruments and *C*-statistics are computed to test the exogeneity of the individual instruments (Hayashi, 2000). Finally, a test of whether the potentially endogenous variables of prayer and family income are actually exogenous is performed jointly and singly (Hayashi, 2000). All equations incorporate the probability weights provided with the data. Robust standard errors are estimated to correct for potential heteroscedasticity. All analyses are performed using Stata 10.1.

IV. RESULTS

The joint strength of the instruments is such that maximal bias is less than 10% (Kleibergen-Paap rk Wald *F*-statistic: 30.26; critical value: 4.72). Note that the critical values for LIML are much smaller than for two-stage least squares (Stock and Yogo, 2005). The overidentification test of all of the instruments fails to reject the null hypothesis that the identifying instruments are exogenous (Hansen's *J* test: 2.62, $p = 0.27$). In addition, tests of each individual instrument also fail to reject the null hypothesis of exogeneity (prestige score of spouse's occupation, *C*-statistic: 0.78 , $p = 0.38$; prestige score of father's occupation, *C*-statistic: 0.06 , $p = 0.81$; religious portion of the PSCI, *C*-statistic: 2.62, $p = 0.11$; fundamentalist religious upbringing, *C*-statistic: 2.04 , $p = 0.15$). A joint test of the endogeneity of the frequency of prayer and family income rejected their exogeneity (χ^2: 7.23, $p = 0.03$).

The final estimates are presented in Table 2. Both the frequency of prayer and family income display the predicted signs. Using the estimates presented in Table 2 for the frequency of prayer and family income, the estimate of equation (2) using the log-lin format of equation (3) is $-(\beta_1/\beta_2)$ or $-(0.011/0.010) = -1.1$ or
-$11,000 per annum for adding an additional weekly prayer session. The negative sign simply means that this is the amount of the money a person would need to pay in order to maintain the same level of happiness if they increased their praying by one prayer session per week. Put another way, the amount of happiness that an extra prayer session per week is worth is the same amount of happiness that $11,000 provides. At the sample mean of 8.1 prayers per week, individuals are 9% more happy relative to those who do not pray at all which is valued at $89,100 per annum.

V. CONCLUSION

This finding suggests that the average religious individual gains great value from individual religious practices such as prayer. This suggests that the role of religion in U.S. society is extremely important and should therefore be routinely considered in both policy and economic analysis to determine when and where it matters. Although this is increasingly occurring, economists should consider including measures of religiosity as control variables whenever available.

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Table 1: Descriptive Statistics

Variables	*Mean*	*Std. Dev.*
Experienced Utility		
Happiness	2.223	0.625
Religious behavior		
Weekly frequency of prayer	8.113	8.152
Income		
Family income ($10,000s, 2004 dollars)	5.594	5.906
Other demographic information		
Female	0.528	-
Age 25 - 34	0.204	-
Age 35 - 44	0.217	-
Age 45 - 54	0.196	-
Age 55 - 64	0.121	-
Age 65 - 74	0.085	-
Age 75 and older	0.059	-
Black	0.128	-
Other race	0.077	-
Married	0.557	-
Widow	0.065	-
Divorced/separated	0.141	-
High School	0.548	-
Some college/associate's degree	0.073	-
Bachelor degree	0.158	-
Graduate school	0.082	-
Instruments		
Occupational prestige score – respondent's spouse	23.618	24.698
Occupational prestige score – respondent's father	34.856	20.965
Moderately religious upbringing (at age	0.418	-
Petris Social Capital Index (religious portion)	0.526	0.124
Observations	6,412	

Table 2. Second-Stage Equation (LIML): Natural Logarithm of Happiness

Variable	*Parameter*	*t-statistic*
Religious behavior		
Frequency of prayer	0.011	3.19**
Income		
Family income ($10,000s, 2004 dollars)	0.010	2.40*
Other demographic information		
Female	-0.022	-1.72
Age 25 - 34	0.000	0.02
Age 35 - 44	-0.060	-2.85**
Age 45 - 54	-0.069	-2.98**
Age 55 - 64	-0.057	-2.40*
Age 65 - 74	-0.017	-0.65
Age 75 and older	-0.018	-0.60
Black	-0.076	-3.55**
Other race	-0.087	-4.43**
Married	0.091	5.04**
Widow	-0.050	-2.15*
Divorced/separated	-0.049	-3.05**
High School	0.042	2.59**
Some college/associate's degree	0.053	2.17*
Bachelor degree	0.062	2.48**
Graduate school	0.060	1.93*
Year fixed effects		
1996	0.024	1.62
1998	0.023	1.55
2000	0.041	3.05**
2002	0.017	1.20
Constant	0.568	18.38**
F-statistic	21.71**	
Observations	6,412	

LIML: limited information maximum likelihood
Note: Family income and frequency of prayer are estimated using instrumental variables
Note: R^2 is not reported as it is not meaningful in second stage estimates.
** Statistically significant at 1% (two-tailed test)
* Statistically significant at 5% (two-tailed test)