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# Faith, frequency, and the allocation of time: a micro level study of religious capital and participation

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## Abstract

A reduced form two equation set up is estimated where the endogenous variables are the intensity of religious belief and the frequency of attendance at services. A sample of 4548 people was obtained from a household interview study conducted in the UK in 1990–1. The results show differences between faiths in terms of relative frequency of service attendance and the intensity of conviction. Variables that proxy elements of the allocation of time model are statistically significant. There are very large and significant independent effects of parental religious belief and persistence of the beliefs held in adolescence. © 2000 Elsevier Science Inc. All rights reserved.

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## 1. Introduction

Inspired by the work of Becker, economists have made many contributions to the study of religion (surveyed in Iannacone, 1995) some of which have lead them into conflict with more traditional scholars in the field. The most basic application of economics in this area is to use supply and demand analysis in the form of a demand for religious products (services, bibles, icons, television shows, etc.) and a supply of time to religious activities (going to church, arranging flowers, helping in fund raising activity, etc.). The biggest stumbling block

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for economists in applying these concepts is obtaining data that is capable of yielding sufficient insight into religious behavior.

This paper exploits a hitherto neglected source in the form of a household interview study conducted in the UK in 1990 through 1991. A usable sample of 4548 people is obtained. This study controls for a wide range of 'taste' and time allocation variables for a fairly diverse range of denominations. Earlier studies have tended to be hampered by being based on having only aggregate data, being based on a specific religion (Neuman, 1986) and/or being too small to account for a spread of denominations (for example the 1991 International Social Survey Program Religious Survey has  $n$  equal to only 1066 for England and 1336 for the United States; see Smith et al., 1988, p. 28). Sawkins et al. (1997) have a survey of 3470, in Britain, but this has a limited range of variables on denominations and religious background.

In this paper, a reduced form two equation set up is used where the endogenous variables are the intensity of religious belief and the frequency of attendance at services. The results show striking differences between faiths in terms of their relative frequency of service attendance and the intensity of their conviction. Variables that proxy elements of the allocation of time model are statistically significant lending support to the economic approach. There is evidence of income as well as substitution effects. There are also very large and significant independent effects of parental religious belief and persistence of the beliefs held in adolescence.

## **2. Previous research**

It is unclear what the first economic analysis of religion was although some priority might be ascribed to Marx's dictum that "religion is the opium of the people." The seminal paper on the economics of religion was by Azzi and Ehrenberg (1975) and focused on attendance. Subsequent contributions have tended to divide between, demand side, follow on studies of attendance (Long and Settle, 1977; Ehrenberg, 1977; Neumann, 1986; Smith, 1993; Sawkins et al., 1997; Baimbridge and Whyman, 1997) and those which exhibit a more recent focus on supply side factors in the form of interdenominational competition (e.g., Hamberg and Peterson, 1994; Stark and Iannacone, 1994; Hall and Bold, 1998) with this also being applied to the determination of financial contributions (Zaleski and Zech, 1992, 1995). Sullivan (1985) simultaneously modeled the determination of financial contributions and church attendance. The dominant findings in these studies are of strong substitution effects in the form of higher earnings leading to lower church attendance that dominate income effects. A significant u-shaped age profile is also sometimes observed. One might be lead to the conclusion that economic factors will, with economic growth, eradicate religion altogether but this is a little hasty as we shall see. Obviously one constraining factor is the formation of strong religious beliefs, particularly in adolescence, which is shown to be significant in Smith et al. (1998).

## **3. Modeling conviction and attendance**

It is convenient to divide the following discussion into two parts. Firstly, I shall consider the determination of frequency of service attendance for a given level of religious conviction,

or strength of faith, which I shall denote as God Appreciation Capital (GAC) and then go on to consider the simultaneous dynamic linkage of GAC and service attendance.

The relevant model is the standard utility maximization framework subject to time constraints approach as pioneered in this area by Azzi and Ehrenberg (1975). Tastes are assumed to be given and utility is derived through combining goods, purchased from the market, and time to produce commodities. The relevant commodity here would be the overall 'religious experience' that might derive from service attendance, scholarship, pilgrimage, watching religious television, or giving to the church. The ultimate constraints are therefore prices of goods, rates of return on human and nonhuman capital, the fixity of time, and the state of technology. From such a model, there emerges a derived supply of time to service attendance with some fairly clear predictions for the impact of the key variables. Increased costs of attendance in the form of travel time required, or fixed precommitment time requirements to other activities, plus monetary expenditures should decrease the level of attendance as there is substitution at the margin. Income should be positively correlated with attendance, *ceteris paribus*, so long as religious services are a normal good. Services are, of course, only one element of the religious experience and, as such may exhibit a declining income elasticity if there is substitution to other elements such as donations or consumption of religious products like television shows or music which have a much lower time intensity.

On the other hand, religious services may confer certain network externalities that are not available for less time intensive forms of religious consumption. For example, one's business prospects may be enhanced through regular meetings with key individuals through church. On a more personal level, the worship site has been a historically important mode of searching for a marital partner. These factors impart a 'club good' (Buchanan, 1965) dimension to attendance at a service. For historical and socio-cultural reasons such benefits will vary across denominations; for example in a faith where 'out' marriage faces relatively high stigma costs there is a greater incentive to attend services frequently in the implicit search for a partner.

Treatments like the above always bring anxiety to the noneconomist on the grounds that religious belief is not a commodity, like soap powder, to be traded at the margin but rather is strongly autonomous being fixed by the personality and upbringing of the individual in question. Sawkins et al. (1997) echo this in saying:

Our results lead us to conclude that a Becker-style model in terms of economic variables such as wage rates, is supported, but runs the risk of serious mis-specification if it omits other "sociological" variables such as denominational affiliation and the intensity of belief.

The Chicagoan model of rational 'addiction' or 'habits' (Iannacone, 1984; Becker and Murphy, 1988) incorporates this critique within the broadly neo-classical approach with which we began this section. Now, GAC becomes endogenous with the frequency of service attendance. A high level of attendance helps form religious capital which in turn increases the level of attendance because the marginal utility of an extra minute of service will be rising over some ranges of increasing belief capital. Obviously, some individuals have neutral, or even negative, tastes for religion and will never develop GAC regardless of

sustained levels of exposure. At the other extreme, some individuals may have sufficiently strong intrinsic beliefs that there will be no diminution in response to changes in exogenous variables. However, even these individuals will exhibit some responsiveness frequency of service attendance to economic factors such as the shadow price of time. Our expectation is that they will have little consequential loss of GAC. The GAC factor will differ across individuals due to exposure at an early age to parents' views on religion, that is formation of religious capital within the home, as well as exposure to services. The level of adolescent exposure will also derive from varying 'denominational strictness' (Iannacone, 1992). Observance in some religions is not firmly laid down, with respect to frequency, whereas with others such as Roman Catholics and Muslims there may be an expectation of attending large menu of formally stipulated services. The power of denominational strictness will clearly be circumscribed by supply side factors as the travel to service costs will be determined to a large extent by the brute fact of worship site location. Of course, this too can become endogenous; Muslims are engaged in fairly extensive building of fairly basic mosques and are even quite prepared to turn rather humble everyday inner city housing into mosques. This flexibility in the forms of worship, in a supposedly strict religion, may be a response to the threat of economic factors to their future and is thus part of the supply side that is treated as exogenously determined in this paper.

Following from the above, there are two main features of estimating models of religious participation. The first is that although variables that reflect a high shadow price of time should lead to a fall in religious activity through the substitution effect they should also engender a positive income effect. The role of the income effect is downplayed by Iannacone (1995) when he argues that contributions to church funds should rise relative to attendance at services as earnings rises due to value of time induced substitution effects. This also ignores the fact that the psychic value of service participation may only be weakly replaced by other forms of religious activity. Further, the level of attendance is specific to the culture in which statistical inquiries are conducted. Part of this effect is due to the network benefits that may not be religious in origin; for example the chance to meet potential friends or relationship partners or to further one's business interests. Further, church attendance may be part of an adjustment mechanism in response to external shocks such as the loss of a partner or close relative.

The rest of this paper is premised on there being underlying derived structural equations for attendance at services and strength of belief (GAC). These will be simultaneously determined and there is thus no way of identifying them separately. Accordingly, we estimate reduced form equations for the two endogenous variables in which the coefficients will indicate the estimated net effects of a change in the endogenous variables after the sequence of GAC-frequency interactions have been solved out. My approach has not previously been implemented in the literature; Sawkins et al. (1997) estimate a structural equation for frequency of attendance with strength of belief on the right hand side but they treat this as an exogenous variable despite the fact that a rational addiction model clearly implies reverse causation. Apart from the coefficient bias problem, such an equation will not be identified unless one treats frequency as recursive on GAC with appropriate restrictions on the covariance of the error terms.<sup>1</sup>

#### 4. Data and estimation

The data are taken from the National Survey on Sexual Attitudes and Lifestyles (NSSAL) carried out, by professional market researchers, in England and Wales in 1990 through 1991. This was a rigorously conducted survey of 18,876 adults of ages from 16 to 59. The questions were extensively piloted and a lengthy in person interview was combined with separate self-completion schedules. Although, the purpose of the study was to examine responses to the threat of AIDS it was done in the context of a thorough examination of the overall lifestyles and socio-economic circumstances of the individuals. The sexual content was revised carefully to ensure the maximum participation, across all demographic groups, by avoiding fall out through embarrassment or distaste. One criticism that might be voiced, in the context of this study, is that only the more 'liberal' members of some more conservative religions might respond because of distaste at the sexual content. Evangelical Christians might also boycott such a survey. Although one can never be entirely sure if this is a serious problem, there is some consolation in the fact that the interview part of the survey was largely nonsexual whereas the mainly sexual content was filled in privately in a booklet.

Two samples are available. The 'long' version comprises 4548 individuals and contained a detailed investigation of religious beliefs and sexual attitudes. The 'short' version contains church attendance but lacks the detail on the other religious variables that we require. Hence only the 'long' sample is used in the econometric work that follows. The data was provided by the ESRC Data Archive at the University of Essex, on a CD-ROM.

The model to be estimated consists of two equations that are reduced forms for the endogenous variables: god appreciation capital (in the form of strength of belief) measured by GODNOW and frequency of attendance at church measured by GOSERVICE.

$$\text{GODNOW} = f(\text{GOD16, GODFOLKS, DENOM, Y, MARSTAT, RACE, TIME, AGE, SEX, STYLE, CONTROL, } u)$$

$$\text{GOSERVICE} = f(\text{GOD16, GODFOLKS, DENOM, Y, MARSTAT, RACE, TIME, AGE, SEX, STYLE, CONTROL, } v)$$

where  $u$  and  $v$  are disturbance terms and the other variables are defined below.

The full set of variable definitions is given in Table 1. The attendance variable (GOSERVICE) is constructed by converting interval measures such as weekly, monthly into annual equivalents by appropriate multiplication. This scale is attenuated at the top end as it does not give the exact number of attendances for a high attender. The strength of belief variable is coded 0,1,2 according to 'no' 'some' and 'strong' beliefs in response to the relevant question.

The majority of the variables are dummies although some are scales of a limited nature. Direct earnings are not available.

The income variable ( $Y$ ) is proxied via a series of variables that are well known to be highly correlated with earnings. These comprise educational attainment, unemployment plus variables for type of housing, homeownership, and the quality of the housing area in which the respondent resides.

Table 1  
Variable definitions and expected signs of coefficients

Name	Definition	
Godnow	Current strength of belief in God :question is 'how important are religious beliefs to you'; coded as 1 = fairly important, 2 = very important, 0 = otherwise	
Goservice	Frequency of attendance at church converted to annual equivalents from interval answers	
God16	Equivalent variable to Godnow for when aged 16	
Godfolks	= 1 if parents had strong religious beliefs when you were aged 16	>0
Faith dummies		
Hindu	= 1 if Hindu	?
Jew	= 1 if Jewish	?
Muslim	= 1 if Muslim	>0
Rcath	= 1 if Roman Catholic	>0
Sikh	= 1 if Sikh	?
All remaining faiths set = 0		
Black	= 1 if gives ethnic origin as black	>0
Asian	= 1 if gives ethnic origin as Asian	>0
Othrace	= 1 if nonwhite, black or Asian	?
Age	Current declared age in years	+
Female	= 1 if female	+
Olevel	= 1 if highest educational qualification is 'O' levels	>0
Alevel	= 1 if highest educational qualification is 'A' levels	>0
Deg	= 1 if highest educational qualification is degree	>0
Othql	= 1 if highest educational qualification is a other	>0
Poor	= 1 if live in a housing area deemed to be poor	<0
Middle	= 1 if live in a housing area deemed to be of 'middle' income status	>0
Affluent	= 1 if live in a housing area deemed to be affluent	>0
Bungalow	= 1 if lives in a bungalow	>0
Det	= 1 if lives in a detached house	>0
Semi	= 1 if lives in a semi-detached house	>0
Ownhouse	= 1 if a homeowner	>0
Divorced	= 1 if divorced	>0
Married	= 1 if married	?
Widowed	= 1 if widowed	>0
Cohab	= 1 if cohabitating	<0
Unemp	= 1 if currently unemployed	?
Awaylot	= 1 if away from home a lot	<0
Awayocc	= 1 if away from home occasionally	<0
Inmove	= 1 if have been in the area <5 years	?
Longhour	= 1 if job involves 50+ h per week	<0
Shift	= 1 if employed in shift work	<0
Bigfag	= 1 if heavy smoker	<0
Litfag	= 1 if light smoker	<0
Exfag	= 1 if former smoker	<0
Listen	= 1 if there was someone else possibly listening during the interview	<0
The following dummies are = 1 for the name of the region stated		
Eangl	East Anglia	
Emids	East Midlands	
Glond	Greater London	
Nwest	North West	
Scotl	Scotland	
Southe	South East	
Southw	South West	
Wales	Wales	
Wmids	West Midlands	
Yandh	Yorkshire and Humberside	



Time constraints (TIME) are represented by the variables for shiftwork (SHIFT), long hours of work (LONGHOUR) and working away from home (AWAYLOT, AWAYOCC). These should all have negative coefficients. Working away from home might not alter the proximity of worship sites, at service times, substantially but even then there should still be a negative effect due to the amount of time foregone in travel costs and the loss of network and psychic benefits from attending a church that is not one's own (if working away coincides with usual service attendance).

Using a similar database, Sawkins et al. (1997) found no significant effect on frequency of the SHIFT variable although they do not include the other controls. We also include a variable for being a recent migrant to the area (INMOVE) as this might weaken the strength of religious ties.

The denomination of the individual (DENOM) is represented by a series of dummies for the major religious groups, outside of the traditional UK mainstream.

Race variables are included as separate dummies to allow for differing within denomination intensity for Blacks and Asians. Likewise a FEMALE dummy is included to allow for past findings of greater religiosity among women.

The AGE variable is given in continuous years and appears on human capital grounds. The argument is sometimes given that as you approach death the value of religion rises as you are investing in the after life (in case there is one). A u-shaped age relationship with age can be derived on the grounds of wage effects (Sullivan, 1985; Sawkins et al., 1997).

The lifestyle of the individual (STYLE) is included as a taste control. Individuals who have a more hedonistic and/or risk oriented personality are less likely to have strong religious observance although there is obviously a problem of potential mutual causation here. STYLE is represented by three dummies that measure present or past participation in cigarette smoking.

The role of marital status (MARSTAT) is captured by dummies for status with 'single' being the reference group.

Marital status variables will contain a mixture of religious attitudes, not elsewhere measured, and the potential presence of network externalities. Finally, we include a CONTROL variable to capture the differing degrees of truthfulness in interview data.

The survey reports a coding by the interviewer if someone was nearby listening while the interview took place. This has been used to construct the dummy LISTEN on the grounds that a mis-truth might bring later psychic costs from the overhearer.

I also included dummies for the standard regions of the U.K. It is difficult to be specific about what effects might show up here as there will be influences of church density as well as cultural factors of differing historic levels of religiosity in different regions.

To avoid an over burdening discussion of the expectations on the coefficients, the signs of these are appended to Table 1.

## **5. Results**

A variety of results are shown in the paper because of the need to try different approaches due to the underlying problems of measurement. A broad summary of all the results would

be that the social capital of parental belief systems and own beliefs in adolescence are the strongest determinants of attendance at religious services. There are marked differences by the faith of individuals that are not always equivalent for strength of belief and frequency of attendance. However there is also an important role played by the scarcity and value of time.

The reduced form equations for frequency of attendance and god appreciation capital (expressed strength of religious conviction) are shown in Table 2. The R squared shown here and throughout the paper are fairly typical of those found in the literature. These are standard OLS estimates that are not entirely satisfactory from a technical point of view<sup>2</sup> but give a useful insight into the statistical relationships. The major econometric problem is the bounding of the variables below, at zero, and above by the number of services which is additionally restricted in my data by there being no category in the raw codings for more than once a week. There is an additional problem of sparsity in the interval nature of the attendance variable.<sup>3</sup>

Accordingly the top predicted attendance (degree level Asian living in Scotland with highly religious parents and a high degree of belief at age 16)<sup>4</sup> is around 44 times per year. This seems not unreasonable given the presence of holidays and other interruptions plus the 'top coding' attenuation. There is overwhelming evidence of the strength of carry over of god appreciation capital from adolescence. All four coefficients are highly significant and positive and notably large in magnitude.

The estimated effects of own beliefs at age 16 are much larger than those for parental beliefs.

There is evidence of an income effect, from the coefficients for university degrees and living in areas deemed to be affluent, which translates into a net positive relationship for frequency without a corresponding change in conviction. This is probably indicative of scale attenuation as the variables at the other end of the scale (poor housing areas and unemployment) are not significant in either equation. The degree level coefficient is significantly larger than the 'A' level coefficient. These effects do not translate into conviction effects although this may merely reflect attenuation at the upper end.

Substitution effects are also apparent in the significant negative effects of working long hours and being away from home a lot on frequency.

Turning to the marital status variables we find that marriage and widowhood bring no difference, on either dimension, from the religious disposition of single individuals.

Cohabitation results in a significant reduction in church attendance that is probably not surprising. Although divorce had no effect on frequency it had a small significant positive effect on conviction which might be a 'solace' effect.

There are notable differences in the denomination coefficients. Unfortunately, from a statistical point of view, the racial effects are partly confounded with the religion effects, for example most Muslims in the UK, in this sample, would describe themselves as Asian. Taking this into account it seems that Muslims and Roman Catholics have much greater frequency than others with Roman Catholics being by far the greatest frequenters. This could be ascribed to the strictness of these faiths concerning observance. Both of these religions tend to have more specific additional services, to a weekly routine, than the others. These higher levels of observance also translate into a higher level of conviction. In contrast, Jewish



Table 2  
 OLS regressions for frequency of observance and strength of faith

Dependent Variable	GOSERVICE (absolute 't' ratios in brackets below coefficients)	GODNOW
Affluent	1.327 (1.997)	-0.021 (0.582)
Age	0.025 (0.025)	-0.00032 (0.245)
Alevel	1.795 (2.816)	0.038 (1.09)
Asian	12.874 (4.416)	-0.111 (0.694)
Awaylot	-3.397 (2.726)	-0.256 (3.779)
Awayocc	-0.02 (0.029)	-0.0275 (0.735)
Bigfag	-4.183 (7.158)	0.0149 (0.469)
Black	5.895 (3.734)	0.041 (0.495)
Bungalow	0.556 (0.710)	0.1083 (1.671)
Cohab	-3.344 (3.579)	0.0043 (0.082)
Deg	3.837 (4.436)	0.007 (0.149)
Det	0.831 (1.231)	0.039 (1.063)
Divorced	-0.24 (0.287)	0.134 (2.947)
Eangl	-0.62 (0.421)	0.0616 (0.767)
Emids	0.866 (0.732)	0.123 (2.014)
Exfag	-0.597 (1.009)	0.0003 (0.011)
Female	0.249 (0.497)	0.0924 (4.46)
Glond	-0.447 (0.4)	0.0455 (0.746)
God16	6.823 (13.081)	0.635 (22.353)
Godfolks	2.468 (5.119)	0.296 (11.269)
Hindu	-7.37 (1.732)	0.414 (1.788)
Inmove	0.447 (0.847)	-0.0573 (1.996)
Jew	-0.291 (0.097)	0.565 (3.461)
Listen	0.631 (1.406)	-0.005 (0.219)
Litfag	-3.454 (5.373)	0.018 (0.528)

(continued on next page)

Table 2 (continued)

Dependent Variable	GOSERVICE (absolute 't' ratios in brackets below coefficients)	GODNOW
Longhour	-1.227 (1.834)	0.018 (1.638)
Married	-0.352 (0.547)	0.0383 (1.093)
Middle	0.408 (0.683)	-0.037 (1.14)
Muslim	5.426 (1.913)	0.275 (1.782)
Nwest	1.051 (0.981)	0.0048 (0.082)
Olevel	0.421 (0.723)	0.017 (0.55)
Othql	-0.119 (0.073)	-0.027 (0.309)
Othrace	0.406 (0.189)	0.042 (0.355)
Ownhouse	-0.399 (0.744)	-0.004 (0.14)
Poor	0.703 (1.007)	-0.066 (1.742)
Rcath	10.824 (15.104)	0.126 (3.218)
Scotl	2.368 (2.162)	0.01 (0.173)
Semi	0.368 (0.712)	-0.001 (0.044)
Shift	-0.503 (0.812)	-0.0477 (1.569)
Sikh	-2.806 (0.505)	0.176 (0.584)
Southe	-0.425 (0.423)	0.04 (0.734)
Southw	0.192 (0.165)	-0.0353 (0.557)
Unemp	0.344 (0.411)	0.0223 (0.496)
Wales	0.304 (0.241)	0.066 (0.96)
Widowed	2.343 (1.43)	-0.005 (0.057)
Wmids	2.3082 (1.814)	-0.034 (0.242)
Yandh	-0.995 (0.873)	-0.06 (0.989)
(Constant)	0.724 (0.491)	0.247 (3.082)
R Squared	0.204	0.24
N	4508	4508

respondents, the only group with significantly higher conviction, do not deviate significantly from the frequency of the base group.

The linear age response, reported in Table 2, failed to be significant; this also proved to be the case when a quadratic in age was used. As this contradicts the literature, I experimented further with age dummies (16–19, 20–29, 30–39, 40–49, and 50–59), which did not bring any notable change in the other results. Of these dummies, only the 20 through 29 age group was significant, being negative in the attendance equation ( $t = -3.18$ ), at the 5% level on a two-tailed test. This conforms to some degree with the usual u-shaped relationship.<sup>5</sup> Although women express significantly greater conviction this does not translate into any difference in frequency.

There is little evidence of significant residual differentials in strength of belief once other factors have been controlled for. Only two regions stand out; Scotland displays higher attendance and the East Midlands greater conviction.

## 6. Some refinements in estimation

The above results are somewhat crude due to the difficulties of measuring religious involvement in survey data.

Some additional results adopting different definitions of the endogenous variables are shown in Tables 3–5. Table 3 shows a binary logit for ‘ever attend’ versus ‘never attend’ church (DOESGO) and a binary logit for some strength of religious belief versus none in particular (GNOWDUM) is shown in Table 4.

In Table 5, a logit for a high level of attendance (GOLOTS = 1 for at least once a week; = 0 otherwise) is presented. Table 6 shows an OLS equation, for frequency of service attendance, on the sample restricted to those who ever attend.

Given the underlying difficulties in measuring the endogenous variables, there is no really ‘correct’ or overwhelmingly convincing technique to apply to the estimation.

Consequently, applying all these formulations and looking for similarities and discrepancies is the most appropriate strategy. The broad picture depicted, in Table 2, is little altered by the results in Tables 3 through 6. In terms of income variables, AFFLUENT comes through strongly as a positive influence as do ‘A’ levels and university degrees (apart from the belief results). There is an anti-Marx result at the other end of the scale as poor housing and unemployment seen to contribute little. There are strong positive results almost all the way through for the BLACK, ASIAN, JEW, and RCATH variables.

The large and very significant effects of the childhood conditioning, or religious capital, variables, are maintained in the additional results and the ordering of the size of these two effects is maintained. Looking across the results, it seems that the negative impact of cohabitation is on the frequency with which people, who attend, decide to go rather than in the determination of whether to attend.

In the OLS regression for attendees only, there is not surprisingly some weakening of the results compared with Table 2.

The income related and substitution terms all perform worse; only AFFLUENT of the income terms is now significant at the 5% level.

Table 3  
Logit equations for ever attending church [DOESGO]

Variable	B	S.E.	Wald	df	Sig	R	Exp (B)
Affluent	.1498	.1121	1.7861	1	.1814	.0000	1.1616
Age	.0081	.0042	3.6842	1	.0549	.0171	1.0081
Alevel	.6134	.1115	30.2597	1	.0000	.0699	1.8467
Asian	.9804	.4883	4.0313	1	.0447	.0187	2.6655
Awaylot	-.2420	.2222	1.1860	1	.2761	.0000	.7850
Awayocc	.1505	.1170	1.6540	1	.1984	.0000	1.1624
Bigfag	-.6710	.1081	38.5144	1	.0000	-.0794	.5112
Black	.6529	.2492	6.8661	1	.0088	.0290	1.9212
Bungalow	-.0828	.1784	.2154	1	.6426	.0000	.9205
Cohab	-.8206	.2020	16.4954	1	.0000	-.0501	.4402
Deg	.8591	.1453	34.9377	1	.0000	.0755	2.3610
Det	.3561	.1134	9.8692	1	.0017	.0369	1.4278
Divorced	.1597	.1484	1.1585	1	.2818	.0000	1.1731
Eangl	.4558	.2540	3.2212	1	.0727	.0145	1.5774
Emids	.5038	.2105	5.7304	1	.0167	.0254	1.6550
Exfag	-.0451	.0986	.2089	1	.6476	.0000	.9559
Female	.3843	.0871	19.4450	1	.0000	.0549	1.4686
Glond	.3057	.1998	2.3407	1	.1260	.0077	1.3576
God16	1.2236	.0828	218.2205	1	.0000	.1933	3.3995
Godfolks	.5745	.0798	51.8796	1	.0000	.0929	1.7762
Hindu	.1715	.7002	.0600	1	.8066	.0000	1.1870
Inmove	.0119	.0912	.0171	1	.8960	.0000	1.0120
Jew	1.2144	.4798	6.4048	1	.0114	.0276	3.3681
Listen	.0014	.0786	.0003	1	.9855	.0000	1.0014
Litfag	-.2776	.1132	6.0148	1	.0142	-.0263	.7576
Longhour	-.0657	.1166	.3171	1	.5734	.0000	.9364
Married	.1283	.1133	1.2820	1	.2575	.0000	1.1368
Middle	-.0943	.1035	.8304	1	.3622	.0000	.9100
Muslim	.9848	.4653	4.4793	1	.0343	.0207	2.6772
Nwest	.2830	.1927	2.1571	1	.1419	.0052	1.3272
Olevel	.2297	.1056	4.7335	1	.0296	.0217	1.2583
Othql	.4959	.2732	3.2947	1	.0695	.0150	1.6420
Othrace	-.4463	.3647	1.4979	1	.2210	.0000	.6400
Ownhouse	.0419	.0961	.1902	1	.6628	.0000	1.0428
Poor	-.0988	.1246	.6286	1	.4279	.0000	.9059
Rcath	1.4411	.1197	145.0481	1	.0000	.1572	4.2252
Scotl	.5334	.1954	7.4481	1	.0064	.0307	1.7047
Semi	.0548	.0915	.3588	1	.5492	.0000	1.0564
Shift	-.1449	.1107	1.7109	1	.1909	.0000	.8651
Sikh	.0262	.9268	.0008	1	.9774	.0000	1.0266
Southe	.4207	.1810	5.4045	1	.0201	.0243	1.5231
Southw	.1430	.2083	.4714	1	.4923	.0000	1.1538
Unemp	-.0840	.1588	.2798	1	.5968	.0000	.9194
Wales	.2448	.2286	1.1470	1	.2842	.0000	1.2773
Widowed	.3208	.2737	1.3735	1	.2412	.0000	1.3782
Wmids	.2848	.2000	2.0267	1	.1546	.0021	1.3295
Yandh	-.0495	.2103	.0553	1	.8141	.0000	.9517
Constant	-2.7382	.2693	103.3845	1	.0000		

Classification Table for DOESGO

Observed	Predicted		Percent Correct
	0	1	
0	2676	359	88.17%
1	712	801	52.94%

Table 4  
Logit equation for any belief in God [GNOWDUM]

Variable	B	S.E.	Wald	df	Sig	R	Exp (B)
Affluent	-.0416	.1148	.1317	1	.7167	.0000	.9592
Age	.0059	.0042	1.9859	1	.1588	.0000	1.0059
Alevel	.0985	.1113	.7827	1	.3763	.0000	1.1035
Asian	.1443	.5880	.0602	1	.8062	.0000	1.1552
Awaylot	-1.0299	.2464	17.4749	1	.0000	-.0501	.3570
Awayocc	-.0826	.1203	.4718	1	.4921	.0000	.9207
Bigfag	-.1944	.1024	3.6047	1	.0576	-.0161	.8233
Black	.6251	.2758	5.1372	1	.0234	.0226	1.8685
Bungalow	.2622	.1806	2.1074	1	.1466	.0042	1.2998
Cohab	-.1669	.1757	.9026	1	.3421	.0000	.8462
Deg	.0400	.1511	.0701	1	.7913	.0000	1.0408
Det	.1086	.1164	.8704	1	.3508	.0000	1.1147
Divorced	.4612	.1447	10.1610	1	.0014	.0364	1.5859
Eangl	.1875	.2546	.5421	1	.4616	.0000	1.2062
Emids	.4168	.2065	4.0732	1	.0436	.0183	1.5171
Exfag	-.1003	.1021	.9660	1	.3257	.0000	.9045
Female	.3534	.0873	16.4012	1	.0001	.0484	1.4238
Glond	.2408	.1975	1.4862	1	.2228	.0000	1.2723
God16	1.9375	.0835	538.6787	1	.0000	.2952	6.9411
Godfolks	.8989	.0777	133.7183	1	.0000	.1463	2.4568
Hindu	1.9707	1.1944	2.7225	1	.0989	.0108	7.1757
Inmove	-.1271	.0929	1.8709	1	.1714	.0000	.8807
Jew	1.3264	.5024	6.9716	1	.0083	.0284	3.7674
Listen	.0176	.0787	.0501	1	.8229	.0000	1.0178
Litfag	-.1693	.1128	2.2517	1	.1335	-.0064	.8443
Longhour	.1588	.1174	1.8308	1	.1760	.0000	1.1721
Married	.1148	.1132	1.0280	1	.3106	.0000	1.1217
Middle	-.1115	.1031	1.1680	1	.2798	.0000	.8945
Muslim	1.8524	.6295	8.6598	1	.0033	.0329	6.3751
Nwest	.0757	.1888	.1608	1	.6884	.0000	1.0786
Olevel	.0207	.1020	.0412	1	.8392	.0000	1.0209
Othql	-.0774	.2825	.0750	1	.7841	.0000	.9255
Othrace	.3246	.4088	.6303	1	.4272	.0000	1.3834
Ownhouse	-.0543	.0944	.3308	1	.5652	.0000	.9472
Poor	-.1842	.1222	2.2698	1	.1319	-.0066	.8318
Rcath	.4994	.1218	16.8225	1	.0000	.0491	1.6478
Scotl	.1292	.1919	.4533	1	.5008	.0000	1.1379
Semi	-.0264	.0908	.0846	1	.7711	.0000	.9739
Shift	-.2049	.1103	3.4519	1	.0632	-.0154	.8147
Sikh	.7943	1.1141	.5084	1	.4758	.0000	2.2130
Southe	.1314	.1775	.5480	1	.4591	.0000	1.1404
Southw	.0137	.2044	.0045	1	.9464	.0000	1.0138
Unemp	.1293	.1477	.7659	1	.3815	.0000	1.1380
Wales	.2031	.2201	.8515	1	.3561	.0000	1.2252
Widowed	.3480	.2761	1.5879	1	.2076	.0000	1.4162
Wmids	.0918	.1956	.2202	1	.6389	.0000	1.0961
Yandh	-.2038	.2028	1.0094	1	.3151	.0000	.8157
Constant	-1.9372	.2610	55.1071	1	.0000		

Classification Table for GNOWDUM

Observed	Predicted		Percent Correct
	0	1	
0	2311	371	86.17%
1	667	1199	64.26%

Table 5  
Logit equation for high level of attendance [GOLOTS]

Variable	B	S.E.	Wald	df	Sig	R	Exp (B)
Affluent	.3926	.1770	4.9195	1	.0266	.0316	1.4808
Age	.0088	.0063	1.9508	1	.1625	.0000	1.0088
Alevel	.3154	.1705	3.4234	1	.0643	.0220	1.3708
Asian	1.4675	.5491	7.1437	1	.0075	.0419	4.3383
Awaylot	-1.1391	.4600	6.1326	1	.0133	-.0375	.3201
Awayocc	-.0607	.1818	.1114	1	.7386	.0000	.9411
Bigfag	-1.1950	.1909	39.1759	1	.0000	-.1126	.3027
Black	.8957	.2962	9.1433	1	.0025	.0494	2.4491
Bungalow	.1908	.2583	.5453	1	.4602	.0000	1.2102
Cohab	-2.0015	.5358	13.9529	1	.0002	-.0639	.1351
Deg	.6210	.2114	8.6288	1	.0033	.0476	1.8608
Det	-.0589	.1777	.1100	1	.7401	.0000	.9428
Divorced	-.1587	.2238	.5028	1	.4783	.0000	.8533
Eangl	-.1883	.4221	.1989	1	.6556	.0000	.8284
Emids	.2336	.3089	.5722	1	.4494	.0000	1.2632
Exfag	-.1105	.1453	.5781	1	.4471	.0000	.8954
Female	-.0899	.1317	.4663	1	.4947	.0000	.9140
Glond	-.0381	.2879	.0175	1	.8946	.0000	.9626
God16	1.2727	.1321	92.7771	1	.0000	.1760	3.5705
Godfolks	.5701	.1311	18.8982	1	.0000	.0759	1.7685
Hindu	-1.2129	.8646	1.9679	1	.1607	.0000	.2973
Inmove	.1835	.1390	1.7433	1	.1867	.0000	1.2015
Jew	-.8212	1.0651	.5945	1	.4407	.0000	.4399
Listen	.1974	.1204	2.6872	1	.1012	.0153	1.2182
Litfag	-.8750	.1957	20.0010	1	.0000	-.0784	.4169
Longhour	-.3362	.1922	3.0603	1	.0802	-.0190	.7145
Married	-.1840	.1693	1.1802	1	.2773	.0000	.8320
Middle	.2031	.1683	1.4565	1	.2275	.0000	1.2252
Muslim	.4850	.5407	.8046	1	.3697	.0000	1.6242
Nwest	.2152	.2699	.6360	1	.4252	.0000	1.2401
Olevel	-.0076	.1663	.0021	1	.9637	.0000	.9925
Othql	-.1639	.4279	.1468	1	.7016	.0000	.8488
Othrace	-.0074	.4640	.0003	1	.9873	.0000	.9926
Ownhouse	-.0971	.1468	.4381	1	.5080	.0000	.9074
Poor	.2797	.1962	2.0316	1	.1541	.0033	1.3227
Rcath	1.5856	.1380	131.9301	1	.0000	.2105	4.8824
Scotl	.4311	.2749	2.4586	1	.1169	.0125	1.5389
Semi	.0117	.1415	.0068	1	.9341	.0000	1.0118
Shift	-.2152	.1807	1.4176	1	.2338	.0000	.8064
Sikh	-.3132	.9382	.1114	1	.7385	.0000	.7311
Southe	-.1633	.2671	.3738	1	.5410	.0000	.8494
Southw	.1337	.3076	.1888	1	.6639	.0000	1.1430
Unemp	-.0486	.2331	.0434	1	.8349	.0000	.9526
Wales	.0059	.3509	.0003	1	.9865	.0000	1.0059
Widowed	.3347	.3669	.8320	1	.3617	.0000	1.3975
Wmids	.5571	.2788	3.9944	1	.0457	.0261	1.7456
Yandh	-.2912	.3265	.7956	1	.3724	.0000	.7474
Constant	-3.8320	.4053	89.3730	1	.0000		

Classification Table for GOLOTS

Observed	Predicted		Percent Correct
	0	1	
0	4039	60	98.54%
1	381	68	15.14%



Table 6  
 OLS Equation for frequency by attenders

Equation Number 1	Dependent Variable GOSERVICE
Variable	Coefficient (absolute 't' in brackets)
Affluent	2.627 (1.654)
Age	0.031 (0.512)
Alevel	-1.307 (0.802)
Asian	9.443 (1.688)
Awaylot	-7.028 (2.126)
Awayocc	-1.261 (0.745)
Bigfag	-8.065 (4.738)
Black	6.949 (2.239)
Bungalow	2.162 (0.819)
Cohab	-8.084 (2.342)
Deg	1.512 (0.753)
Det	-0.156 (0.099)
Divorced	-1.046 (0.477)
Eangl	-5.954 (1.622)
Emids	-2.216 (0.726)
Exfag	-0.436 (0.309)
Female	-2.576 (2.07)
Glond	-4.193 (1.434)
God16	5.483 (4.521)
Godfolks	2.531 (2.102)
Hindu	-8.359 (1.111)
Inmove	1.98 <sup>-1</sup> (1.485)
Jew	-6.307 (1.125)
Listen	1.746 (1.532)
Litfag	-7.922 (4.670)

(continued on next page)

Table 6 (continued)

Equation Number 1	Dependent Variable GOSERVICE
Variable	Coefficient (absolute 't' in brackets)
Longhour	-2.684 (1.563)
Married	-1.996 (1.213)
Middle	1.686 (1.111)
Muslim	1.542 (0.275)
Nwest	1.121 (0.400)
Olevel	-1.874 (1.183)
Othql	-2.6 (0.691)
Othrace	4.562 (0.979)
Ownhouse	-2.338 (1.625)
Poor	2.526 (1.336)
Rcath	10.2 (7.267)
Scotl	2.207 (0.774)
Semi	0.691 (0.513)
Shift	-0.45 (0.274)
Sikh	-3.799 (0.377)
Southe	-4.28 (1.603)
Southw	-0.368 (0.118)
Unemp	3.235 (1.356)
Wales	-1.356 (0.397)
Widowed	4.117 (1.053)
Wmids	3.266 (1.102)
Yandh	-3.46 (1.079)
(Constant)	17.813 (4.429)
R squared	0.156
n	1513

The most curious result is that FEMALE is now significantly negative. Presumably the conclusion to be drawn from this is that although women are more likely to express stronger beliefs and also to attend church they will attend less once they reach this level. An interesting result is that the heavy smoking variable is still significantly positive; hence it seems to predict rate of church attendance as well as whether or not church is attended.

## **7. Summary and conclusion**

This article has added to the economics of the demand for religion by exploiting a hitherto unused data source of 4508 detailed personal interviews. The reduced form equations from a system of simultaneous equations for the strength of religious belief and the frequency of service attendance were estimated.

The results lend weight to the validity of the economic approach to religion. The results were quite strongly supportive of an economic approach to religion particularly if one is willing to accept that the addiction/god appreciation capital formulation approach constitutes bona fide economics rather than being merely taste variation by another name.

## **Notes**

1. Of course, such a model would no longer be a rational addiction model.
2. Essentially the religious attendance problem falls into the category of a continuous variable with a substantial cluster of zero observations and might, therefore, at best practice level be dealt with via some kind of Heckit procedure or, if the appropriate restrictions were met, using a Tobit model. The OLS in Table 2 is equivalent to a 'quick and dirty' Tobit. The additional problems of sparse interval measurement and top coding attenuation mean that it is difficult to argue that any particular approach [for example ordered logits as in Sawkins et al. is better than any other versus a simple high frequency versus all others logit] is really any more correct or better than any other. Accordingly I present a range of estimates that are briefly discussed in Section 6.
3. The dependent variable is not a precise measure but rather an interpretation of response in the nature of about once a month, at least once a week etc. If there were a sufficiently large number of codings this would just be a problem of measurement error that would pass into the disturbance term in the normal way. As the number of codings is small there are additional problems for OLS that I attempt to deal with later using various logit formulations.
4. A much higher level could be achieved for an Asian Roman Catholic but this is getting us into the realm of out of sample predictions; for example there are only four Asians who self-report as Roman Catholics in this sample.
5. The use of a quadratic in age is somewhat crude, in any case, as there is no response to suppose that the relationship is symmetrical.

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