

Religious human capital revisited: Testing the effect of religious human capital on religious participation

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Abstract

The religious economies theory proposes that individuals make religious choices like they make other choices—rationally. This assumption has sparked many theoretical propositions on both the macro- and micro-levels. However, most empirical research has focused on testing the macro-level propositions. This study contributes to addressing this gap by testing the micro-level hypothesis that religious human capital (i.e., religious knowledge and skills) increases religious participation. Previous research typically operationalized religious human capital indirectly through proxy measures, which makes it difficult to separate the effect of religious human capital from the effects of other variables such as religious beliefs, preferences, and religious social capital. As a result, findings from previous studies may support theories other than religious human capital theory. This paper separates different causal effects by using a direct measure of religious human capital (i.e., biblical knowledge), while controlling for other variables deemed important by the literature. Analysis of longitudinal panel studies generally supports the hypothesis.

Keywords

Rational choice, religion, religious human capital, religious participation, social capital

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The social scientific study of religion has in many ways been revolutionized by the introduction of economic and rational choice explanations of religious behavior, often referred to as religious economies theory. One of the core claims of this theory is that religious groups can be analyzed as firms that exist in a 'religious economy', which consists of a market of current and potential religious consumers and religious firms attempting to meet the demand of the market (Stark and Finke, 2000). The underlying theoretical assumptions are that individuals make rational religious choices (i.e., they choose options that maximize their benefits given their preferences, information, and constraints) and their religious preferences remain relatively constant over time, such that any changes in religious behavior must be a result of changes in the benefits or costs associated with the behavior (Stark and Finke, 2000). On the macro-level, the theory assumes that demand (i.e., aggregate preferences) also remains relatively stable and therefore changes in religious consumption (i.e., religiosity) are a result of changes in the supply of religion, rather than changes in demand (Stark and Finke, 2000).

These simple underlying assumptions have led to numerous theoretical propositions and empirical tests (e.g., Iannaccone, 1992; Stark and Bainbridge, 1987; Stark and Finke, 2000). However, much of the empirical research in this area has focused on testing macro-level propositions regarding how the supply of religion in a religious economy affects rates of religious participation, such as church attendance, tithing, praying, reading sacred texts, and so on (e.g., Box-Steffensmeier, 1992; Chaves and Cann, 1992; Finke et al., 1996; Finke and Stark, 1988; Iannaccone, 1991; Stark and Finke, 2000; see Chaves and Gorski, 2001 for a review and Voas et al., 2002, Beyer, 1998, and Bruce, 1993 and 1999 for critiques). Considerably less attention has been given to testing micro-level propositions derived from the theory, even though they form the basis for the macro-level predictions (for recent exceptions see Brodin, 2003 and Lavric and Flere, 2010). In particular, Iannaccone (1984, 1990), extending Becker's (1964, 1981) formulations of human capital, provides the concept of religious human capital (RHC) to explain micro-level variations in religious participation; this has, however, received relatively little empirical investigation. This explanation predicts that just as one's knowledge and skills—human capital—increase the quality of economic (or household) goods, so one's religious knowledge and skills—RHC—increase the quality of religious activities and thereby the benefits one receives from participating. Thus, Iannaccone (1990) proposes that the more RHC an individual has, the more satisfaction (i.e., increasing returns/benefits) she will derive from religious activities, which will thereby increase her participation.

However, there are two alternative explanations for differential religious participation that are not based on the same underlying assumptions as the

religious economies theory: Sherkat's (1997) religious preference adaptivity theory and Montgomery's (1996) application of cognitive dissonance theory. Sherkat (1997) and Montgomery (1996) propose that prior religious participation increases future religious participation through the strengthening of religious preferences or beliefs, respectively. This is distinct from Iannaccone's (1990) RHC theory, which proposes *increasing returns* (not changing preferences or beliefs) as the underlying mechanism explaining increases in religious participation. Distinguishing between these explanations is important because they are based on different theoretical assumptions and propose distinct theoretical mechanisms. Moreover, the implications of Iannaccone's (1990) RHC theory for understanding religious participation are different from those of the other two explanations. If satisfaction from religious participation comes at least partly from having RHC, then RHC should be able to explain variations in religious participation even among individuals with strong religious beliefs and preferences—something which the other two theories are unable to explain.¹ In this way, RHC theory may serve to complement, rather than contradict, the preference adaptivity and cognitive dissonance explanations by explaining differential religious participation among even fervent religious believers.

While some studies have investigated the effect of RHC on denominational mobility, religious consumption, volunteering, bearing religious costs, integration into religious communities, and migration (Abel, 2005; Cameron, 1999; Froese, 2001, 2008; Lavric and Flere, 2010; Myers, 2000; Park and Baker, 2007; Park and Smith, 2000; Sands, 2009), fewer have attempted to apply RHC to explain changes in religious participation over time (Brañas-Garza and Neuman, 2006; Cameron, 1999; Finke and Dougherty, 2002; Iannaccone, 1984, 1990). Thus, it is still empirically unclear whether RHC can account for differential religious participation. While empirical research testing RHC theory is limited, what does exist tends to operationalize RHC indirectly through proxy measures, such as tenure within a particular religion or prior religious participation (see Lavric and Flere, 2010 for a noteworthy exception). Since all three theories—RHC, preference adaptivity, and cognitive dissonance—predict that these variables should increase religious participation, these proxy measures, and the findings that result from them, cannot discriminate between the different explanations. It is not surprising then that RHC theory has received criticism on both theoretical and empirical grounds. Sherkat and Wilson (1995), Montgomery (1996), Bruce (1993, 1999) and others reinterpret Iannaccone's (1990) ambiguous findings as support for their explanations and reject RHC as a factor affecting religious participation.

This paper contributes to the literature by using a direct measure of RHC (i.e., biblical knowledge) to test the hypothesis that RHC increases religious

participation. Unlike previous studies that used proxy measures, using a direct measure of RHC can unambiguously support or contradict the hypothesis. While previous studies tend to use cross-sectional data, I use two longitudinal panels to test whether stock of RHC increases future religious participation, controlling for prior religious participation and other religious and socio-demographic variables. The results generally support the hypothesis. The paper concludes by discussing further applications of RHC theory to other religious outcomes (e.g., religious conversion and exit) and its relevance for understanding the link between macro religious supply factors (e.g., religious regulation by the state) and micro religious behaviors.

Competing theories of longitudinal change in religious participation

Human capital (Becker, 1964, 1981) refers to the skills and knowledge that increase the quality of economic (or household) outputs—or, rather, increase an individual's economic (or household) productivity. This theory may also apply to intangible goods or “abstract commodities such as recreational enjoyment, relaxation, health, and childrearing” (Iannaccone, 1990: 298). These abstract commodities are produced through a combination of “purchased inputs” and one's “own skilled labor and time” (Iannaccone, 1990: 298). Drawing on Becker's theory, Iannaccone (1990) suggests that, like recreational enjoyment, religious goods (e.g., religious satisfaction, relaxation, enjoyment, and appreciation) may also be thought of as abstract commodities, where individuals receive religious satisfaction from participating in religious activities. The inputs to producing religious satisfaction are the same as those producing other types of abstract commodities—purchased inputs, such as religious garments, and “religious human capital.” Religious human capital² (RHC) can be defined as the religious knowledge and skills associated with a particular religion. Although Iannaccone (1990) originally included religious social networks as part of his definition of RHC, Stark and Finke (2000) refined his definition by excluding social ties from it.³ In this way, they separated the social component of religion (i.e., social capital) from the uniquely religious components (i.e., religious human capital). Following from Stark and Finke's distinction, empirical research has generally separated RHC from religious social capital (Abel, 2005; Finke and Dougherty, 2002; Myers, 2000); the current study does the same.

Iannaccone (1990) highlights that an individual's religious satisfaction does not just come from the proficiency of experts or the clergy, but in fact is greatly affected by one's own religious knowledge and skills. This argument suggests, for example, that one cannot fully appreciate a religious

service if one does not understand its rituals and does not know the words to the songs sung and prayers recited. Furthermore, one is generally unable to completely enjoy reading a sacred text without background knowledge of the characters, plots, and religious doctrines associated with it. Sands' (2009: 97) qualitative study of *baalei teshuvah* (Jews who convert to Orthodox Judaism) provides an example of this: "Cynthia (observant 25 years), who did attend [synagogue], said, 'If I don't know the page (in the prayer book), I'm in a panic. I don't really want to ask what page we're up to, or where it is, or if I'm not keeping up. I always feel like that child that's lost in a classroom.'" As this example illustrates, RHC is a key factor in determining "one's ability to produce and appreciate" religious activities (Iannaccone, 1990: 229). Thus, the determinants of participation in religious activities, R , in time period t , can be summarized by the religious production function (Iannaccone, 1998: 1481)

$$R_t = R(T_{Rt}, X_{Rt}, S_{Rt})$$

where T denotes inputs of time, X purchased goods, and S religious human capital. The individual then chooses the quantity of inputs that maximizes his/her overall utility, $U=U(R)$, subject to this production function and the total amount of time and money available to the individual (Iannaccone, 1998: S246).

Individuals primarily gain RHC through religious participation: that is, they learn by doing. As they learn and become skilled at participating—for example, being able to recite Hebrew scriptures correctly and quickly, in the case of Orthodox Jews (Sands, 2009)—their level of satisfaction increases, and so too does their level of religious participation. Iannaccone (1990) states this clearly:

Religious [human] capital is both a prerequisite for and a consequence of most religious activity. Religious [human] capital – familiarity with a religion's doctrines, rituals, traditions, and members – enhances the satisfaction one receives from participation in that religion and so increases the likelihood and probable level of one's religious participation. Conversely, religious participation is the single most important means of augmenting one's stock of religious human capital. Religious activities yield a stock of specialized skills that enhance the satisfaction received from subsequent religious activities" (299).

RHC theory provides an explicit mechanism—*increasing returns*—to account for increased future religious participation. Basically, individuals participate in religious activities that increase their stock of RHC (Iannaccone, 1998: 1481):

$$\Delta S_{Rt} = F(T_{Rt-1}, X_{Rt-1}, S_{Rt-1})$$

This, in turn, increases the benefits they derive from those activities, which results in higher levels of religious participation.

Hypothesis: Larger stocks of religious human capital will increase an individual's level of future religious participation.

Two alternative theories of longitudinal changes in religious participation—religious preference adaptivity⁴ (Sherkat, 1997) and cognitive dissonance⁵ (Montgomery, 1996)—critique Iannaccone's theory and stress the importance of religious preferences and beliefs over RHC. Sherkat (1997) proposes that religious participation may lead to increased levels of future religious participation because *religious preferences become stronger* with increased participation. Contrary to RHC theory (Iannaccone, 1990), the preference adaptivity theory argues that “people do not consume particular cultural items because they have learned to ‘do’ culture (cf. Becker and Murphy, 1988), but because they have learned to like those cultural goods,” or, rather, have come to prefer them (Sherkat and Wilson, 1995: 1019).

Montgomery (1996) also critiques RHC theory and, applying cognitive dissonance theory (Festinger, 1957), proposes that religious participation is affected by levels of religious belief, which is in turn affected by prior religious participation (see also Bruce, 1993, 1999). As proposed by Festinger (1957), cognitive dissonance refers to a psychological condition in which a person has two opposing cognitions. One cognition is a belief (or attitude), while the other is a perception of a voluntary public behavior that is dissonant with the belief. This psychological conflict may be reduced by reconciling one's beliefs with one's public behavior, which can be accomplished by subconsciously adapting one's beliefs to correspond with one's dissonant public behavior.⁶ For example,

consider an individual who does not believe in God and yet attends church regularly. The resulting dissonance might be reduced through an increase in the subjective probability that God exists. In this way, actions directly influence beliefs, even though these actions reveal no new information. Thus, current religious participation leads to an increase in expected utility from future religious participation, *but for a different reason than posited by Iannaccone* (1990) (Montgomery, 1996: 445–446, emphasis added).

Accordingly, this theory proposes that religious participation should *strengthen religious beliefs*, which should increase religious participation.

While all three theories predict that prior levels of religious participation should affect future levels, RHC theory has some different implications. For preference adaptivity and cognitive dissonance theories, religious preferences or beliefs are strengthened through participating in religious activities, which thereby increase future religious participation, regardless of the amount of RHC gained in the process. Although RHC theory predicts that individuals gain RHC primarily through religious participation, individuals participating at the same level do not necessarily gain the same amount of RHC, as people learn and remember religious content at different rates. RHC theory predicts that individuals with the same level of religious participation, belief, and preference, but varying stocks of RHC, will have different levels of future participation (all else being equal). Sands (2009) provides an interesting empirical example of this. The *baalei teschuvah* in her study are extremely passionate about their religious beliefs and practices, demonstrating strong beliefs and what can reasonably be considered an intense preference for Orthodox Judaism. Yet during religious services they experience anxiety because of their lack of RHC, which makes it difficult for them to keep up with the service. Sands (2009) describes how some of the women she interviewed *chose not to attend religious services* because of these difficulties. Ebaugh and Chafetz (2000), in their study of thirteen immigrant congregations, note that congregants may become disengaged during religious services conducted in a holy language that is not understood. This disengagement can occur regardless of how strong the congregants' religious beliefs and preferences are. These findings suggest that strong religious beliefs and preferences are not sufficient for explaining differential religious participation and that RHC is an important factor to consider.

This is not to say that RHC is the only factor affecting religious participation. In fact, religious beliefs, preferences, and RHC may all contribute to increased religious participation over time. In particular, RHC theory supplements what preference adaptivity theory (Sherkat, 1997) and Montgomery's (1996) application of cognitive dissonance theory cannot explain—differential religious participation among even the most zealous believers.

Previous empirical research and methodological shortcomings

Only a few studies have attempted to test or apply RHC theory in order to explain differential religious participation. To do so, these studies have used proxy measures of RHC, such as religious upbringing, frequency of religious participation in childhood, frequency of parents' religious participation in childhood, religious beliefs, and religious participation (Brañas-Garza and

Neuman, 2007; Cameron, 1999; Durkin and Greeley, 1991; Finke and Dougherty, 2002; Iannaccone, 1984, 1990). In lieu of direct measures of RHC, these proxy measures have been extremely useful for suggesting empirical support for RHC theory. However, there are several problems with using these variables in place of direct measures. First, if religious participation is used as a proxy for RHC, then the relationship between RHC and religious participation cannot be tested. Second, using measures of parents' religiosity may confuse the influence of religious social capital with RHC, such that a positive effect of parental religiosity on religious participation may be the result of social influence mechanisms (Sherkat, 1997), rather than increasing returns from participation. Third, religious belief is a particularly poor proxy for RHC. While religious participation and the religiosity of one's parents may cause one to gain RHC through learning and experience, there is no necessary relationship between religious belief and religious knowledge or skills. One may have very strong religious beliefs but lack religious knowledge and skills; conversely, one may have high levels of religious knowledge and skills and yet not believe. As Stark and Glock (1968: 16) point out, "belief need not follow from knowledge, nor does all religious knowledge bear on belief. Furthermore, a man may hold a belief without really understanding it, that is, belief can exist on the basis of very little knowledge." Believing alone does not intrinsically generate RHC and therefore is a weak proxy for it.

Fourth, since the religious preference adaptivity theory (Sherkat, 1997; Sherkat and Wilson, 1995), Montgomery's application of cognitive dissonance theory, and RHC theory all predict that prior religious participation should increase future religious participation, if religious participation is used as a substitute for RHC, then the findings may support any of these theories. Religious belief as a proxy for RHC creates a similar problem, since belief is the key variable in Montgomery's argument and Sherkat and Wilson (1995) used it to infer preferences.

Thus, much of past research testing RHC with proxy variables has been faulted for not providing clear evidence in support of the theory. Bruce (1993: 199, 1999) notes that previous studies did not offer severe tests of the theory "because the same data are compatible with a quite different explanation: that the plausibility of beliefs is a product of [...] social interaction with like-minded believers" in the context of religious activities, which serve to strengthen an individual's religious beliefs. Montgomery (1996) and Sherkat (1997) are also skeptical of the results of past studies and offer their own theories as alternative plausible explanations.

A direct measure of RHC helps solve many of the methodological shortcomings of previous work. In particular, a direct measure allows for a

greater distinction between RHC theory and the other theories. Sands' (2009) and Ebaugh and Chafetz' (2000) detailed qualitative studies and Lavric and Flere's (2010) quantitative study demonstrate how directly capturing religious competencies can help distinguish between RHC and other factors, such as beliefs, preferences, and social influence. Accordingly, this study uses a direct measure of RHC, which allows it to test whether RHC, net of measures of parental influence, religious belief, religious preferences, and other variables (i.e., prior religious participation and socio-demographic variables), increases levels of future religious participation. Although Iannaccone (1990) predicts a recursive relationship between RHC and religious participation, the hypothesis that religious participation increases RHC is intuitive and will not be tested in this study. Instead, this paper focuses on demonstrating the utility of using a direct measure of RHC to test its effect on changes in religious participation over time.

Methodology

The data used in this study come from Project Canada's 1975–1980 and 1990–1995 national panel studies.⁷ These panels are a source of longitudinal information on religion, social issues, and intergroup relations. Questionnaires were sent out to a representative sample of Canadians aged 18 or older in 1975, 1980, 1990, and 1995. These surveys allow for two longitudinal panels: 1975–1980 and 1990–1995. The sampling frame was chosen by stratifying the nation first by province and then by community size, drawing a sample that was proportionate to these populations through randomly selecting participants from telephone directories. A sample weight was created to adjust for differences between the sample and the population in terms of provincial size, community size, and sex. The sample was weighted to roughly 1200 cases, so that large weight factors would not be necessary to accurately represent the Canadian population (see Bibby, 1993 for further methodological details).

Dependent variables

I use four different measures to operationalize religious participation: (1) church attendance, (2) private Bible reading, (3) private prayer, and (4) listening to or watching religious services on the radio or television. For the 1975 and 1980 surveys the dependent variables were coded as follows. Church attendance was coded on a nine-point scale (0= "Never," 1= "Less than once a year," 2= "About once a year," 3= "Several times a year," 4= "About once a month," 5= "2–3 times a month," 6= "Nearly every week,"

7= "Every week," and 8= "Several times a week"). Private prayer and reading the Bible privately were coded with six possible values (0= "I never [insert pray privately or read the Bible], or only in religious services," 1= "Only on special occasions," 2= "Sometimes but not regularly," 3= "Regularly, once a week," 4= "Regularly, many times a week," 5= "Regularly, once a day or more"). Watching or listening to religious services on television or radio has four possible values (0= "No or practically never," 1= "Very seldom," 2= "Yes, sometimes," and 3= "Yes, regularly").

Church attendance for the 1990–1995 panel was coded the same as it was in the 1975–1980 panel. The other dependent variables were coded differently in the 1990–1995 panel as respondents were provided with slightly different response choices. Respondents were asked about frequency of private prayer, reading the Bible privately, and watching religious television programs, which were coded as: 0= "Hardly ever or never," 1= "Monthly," 2= "Seldom," 3= "Sometimes," and 4= "Very often."

Independent variable

Although not attempting to operationalize RHC, several past studies have used biblical knowledge to measure Christian religious knowledge (e.g., Davidson, 1975; De Jong et al., 1976; Faulkner and De Jong, 1966; Finney and Lee, 1977; Fukuyama, 1961; Glock, 1962; Hilty et al., 1984; Hilty and Stockman, 1986; Stark and Glock, 1968). Because religious knowledge is the core component of RHC, this study follows from this previous research and measures RHC as respondents' biblical knowledge in 1975 and 1990. In 1975, respondents were asked the following six questions regarding their knowledge of the Bible: (1) "Is the following an Old Testament prophet – Elijah?" (2) "Is the following an Old Testament prophet – Ezekiel?" (3) "Is the following an Old Testament prophet – Jeremiah?" (4) "Is the following an Old Testament prophet – Deuteronomy?" (5) "Is the following an Old Testament prophet – Paul?" and (6) "Do you happen to know which of Christ's disciples denied him three times?" The first four questions measure Old Testament knowledge, whereas the last two questions measure New Testament knowledge. Correct responses to these questions were coded as 1 and incorrect responses or responses of "I don't know" were coded as 0. This resulted in six binary variables, one for each question. These variables were added together to create an additive RHC index (Cronbach's $\alpha = .724$), where $RHC = \sum(\text{correct answers to the six questions})$ and takes on values from 0 (no correct answers) up to six (correct answers to all six questions). The 1990 survey asked respondents two biblical knowledge questions: (1) "Do you happen to know which of Christ's disciples denied

him three times?" and (2) "Do you happen to know the name of the second book in the Bible?" Again, correct responses were coded as 1 and incorrect responses or responses of "I don't know" were coded as 0. Because there are only two measures of biblical knowledge in this panel, they are not combined into an index, but instead are used as separate binary indicators. Since the RHC indices are measured by biblical knowledge, the *sample was restricted to Protestants and Catholics*.

Although RHC encompasses more than just biblical knowledge, if the hypothesis is accurate, biblical knowledge should at least significantly increase how often one reads the Bible privately, as prior biblical knowledge should increase the returns of future Bible reading. Additionally, to the extent that having biblical knowledge makes attending church or watching/listening to religious services more enjoyable, then church attendance and watching or listening to religious services on television/radio should also be positively affected by biblical knowledge. Previous studies have found that biblical knowledge is correlated with other types of religious knowledge (De Jong et al., 1976; Faulkner and De Jong, 1966; Finney and Lee, 1977; Hilty et al., 1984; Hilty and Stockman, 1986), which suggests it may also be correlated with knowledge of prayers and rituals. If this is the case, then biblical knowledge should also significantly increase how often one prays privately. However, the results should be interpreted with the understanding that biblical knowledge is only one component of Christian RHC.

Control variables

All control variables are taken from the 1975 and 1990 surveys. The models include several socio-demographic control variables: (1) sex (0= "female," 1= "male"), (2) log family income, (3), level of educational degrees obtained, (4) age in years, (5) married (0= "not married," 1= "married"), and (6) race (0= "non-white," 1= "white"). Religious denominational affiliation was also included to control for any differences in religious participation across denominations. Protestant respondents were asked which of the following denominations they consider themselves: Anglican, United Church of Christ (UCC), Lutheran, Baptist, Presbyterian, Methodist, Pentecostal, and "other." The Methodist and Pentecostal categories were combined with the "other denominations" category due to their small sample sizes and were coded as a dummy variable (0= "not affiliated with a Methodist, Pentecostal, or 'other' denomination," 1= "affiliated with a Methodist, Pentecostal, or 'other' denomination"). All other denominations were also coded as dummy variables (0= "not affiliated with the

denomination," 1= "affiliated with the denomination"). Catholic was used as the referent category.

Given Montgomery's (1996) argument about the importance of religious belief for changes in religious participation, beliefs regarding Jesus were also included in the models. Two dummy variables were created: one for belief in Jesus Christ as the Divine Son of God without doubt (1= "yes," 0= "not yes") and another for belief in Jesus Christ as divine but with some doubts (1= "yes," 0= "not yes"). The referent category combines individuals who "feel that Jesus was a great man and very holy, but not the Son of God," "think that Jesus was only a man, although an extraordinary one," or are "not entirely sure there really was such a person." Although religious preference is not necessarily equivalent to religious belief, Sherkat and Wilson (1995) use religious belief as a measure of religious preference, arguing, for instance, that prior belief in the Bible as inerrant implies a preference for religious groups that offer religious goods catering to that preference (e.g., conservative Protestants). Accordingly, the belief in Jesus Christ dummy variables may also be used as proxies for a conservative religious preference, which, according to preference adaptivity theory, should affect future religious participation (Sherkat, 1997). Although religious denominational affiliation is not equivalent to religious preference, denominational affiliations do reflect a package of particular religious beliefs, practices, and organizational structures that may serve as a useful proxy for religious preferences.

Parental religious influence was controlled for in the models. The 1975 survey asked respondents to what extent their mother and father are religious (from 0= not very religious to 2= very religious). These two measures were added together to form a parental religiosity additive index (Cronbach's alpha= .663).⁸ The 1990 survey did not ask the same question, but did ask how often the respondent's mother and father attended religious services while she was growing up (from 0= never to 8= several times a week). These two measures were added together into a parental attendance additive index (Cronbach's alpha= .781). Because of the number of missing cases for the parental attendance questions, such cases were included in the parental attendance index as the value 0 and then controlled for by a binary missing parental attendance measure (1= missing mother or father's parental attendance value, 0= not missing mother or father's parental attendance value). These indices represent different ways of conceptualizing, and controlling for, the significance of religious social capital. If one's social ties affect levels of religious participation through social influence mechanisms, such as sanctions or sympathy (Sherkat, 1997), then how religious a respondent's parents are may affect his level of present and future religious participation.

How often an individual's parents attended religious services while she was growing up is a common proxy measure for RHC, as it is argued that individuals gain much of their RHC during childhood through the religious training they receive from their parents (Iannaccone, 1990). Thus, net of RHC, the parental attendance index should have little to no effect on religious participation (as the theorized effect is due to RHC attainment), whereas the parental religiosity index should still have an effect (as the underlying social influence mechanisms are not related to RHC).

Analytic strategy

I use ordinary least squares (OLS) regression models⁹ to test the relationship between RHC and religious participation. Cross-sectional and longitudinal OLS models were estimated for each of the four dependent variables for each panel. The cross-sectional models estimate the effects of the independent variables at time one (1975 for the 1975–1980 panel and 1990 for the 1990–1995 panel) on the dependent variables at time one. The longitudinal models estimate the effects of the independent variables at time one on the dependent variables at time two (1980 for the 1975–1980 panel and 1995 for the 1990–1995 panel), controlling for the dependent variable at time 1. Thus, the coefficients in the longitudinal model represent how much and whether the temporally prior independent variables are associated with a change in religious participation over time from baseline (time 1) levels. Because this study only tests the effect of RHC on religious participation and not the reciprocal relationship, the longitudinal models predicting religious participation at time 2 (net of religious participation at time 1) are necessary to help eliminate a reverse causal explanation of the findings (i.e., that religious participation affects RHC).

It is important to consider attrition in panel surveys, as attrition reduces the sample size and may affect the national representativeness of the sample. While random attrition does not bias regression estimates, non-random attrition can. Logistic regression models were estimated to determine which time 1 variables affect the likelihood of remaining in the sample at time 2 (results not shown). Specifically, four logistic regression models were estimated for each panel, which allowed each of the four religious participation variables to be included as covariates in their own models, reflecting the OLS models that will be used to analyze the data. The sample weight variable for time 1 is also included as an independent variable in the model, consistent with Little and Vartivarian's (2003) suggestion. For the 1975–1980 panel, older people, individuals with higher family incomes, people with more RHC, individuals affiliated with the United Church of Christ

(UCC), and individuals who frequently watch or listen to religious television/radio were more likely to remain in the sample. For the 1990–1995 panel, older, white, married individuals, individuals affiliated with the UCC, and individuals with higher family incomes were more likely to remain in the sample. To reduce the amount of attrition bias, propensity scores¹⁰ were created to adjust for the probability of remaining in the sample. The propensity scores are used directly as adjustment factors by taking the inverse of the propensity score and multiplying it by the original sample (or base) weight (Wun et al., 2007). The resulting propensity scores were trimmed¹¹ to minimize the influence of outlying cases (i.e., to avoid large weights) (Lumley, 2010). The resulting propensity scores are used as weights in all models to insure that the regression estimates are as representative of the population as possible.

Results

Cross-sectional association

Table 1 provides the cross-sectional 1975 OLS regression results for each of the four time 1 dependent variables. Older individuals have higher frequencies of church attendance, reading the Bible, praying, and watching or listening to religious television/radio. White respondents are more likely than respondents of other races to attend church, read the Bible, and pray, although they do not statistically differ in how often they watch or listen to religious television/radio. More educated individuals attend church and pray more often, and those with higher family incomes read the Bible, pray, and watch or listen to religious television/radio less frequently. Protestant respondents read the Bible and watch or listen to religious television/radio more frequently than Catholics, although those affiliated with the Anglican, UCC, Lutheran, Baptist, or Presbyterian denominations attend church less often than Catholics. Respondents who believe in Jesus Christ as the divine son of God without doubt and those who believe in Jesus Christ as divine with some doubts exhibit significantly higher levels of all four types of religious participation than individuals without such beliefs. Parental religiosity has a strong, statistically significant positive effect on all four types of religious participation. Individuals with more RHC attend church, read the Bible, and pray more often than individuals with less RHC. However, RHC does not have a statistically significant effect on frequency of watching or listening to religious television/radio. These models explain a large amount of the variation in the religious participation variables, ranging from 30.1 percent for watching or listening to religious television/radio to 43.6 percent

Table 1. OLS unstandardized regression coefficients predicting time | dependent variables, Project Canada 1975

	Church attendance		Read Bible		Pray		Watch Relig TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Sex	-0.050 (0.177)	0.209 (0.175)	-0.119 (0.092)	-0.005 (0.090)	-0.120 (0.127)	-0.001 (0.127)	-0.026 (0.074)	-0.023 (0.076)
Age	0.032*** (0.006)	0.031*** (0.005)	0.018*** (0.102)	0.018*** (0.003)	0.025*** (0.004)	0.025*** (0.004)	0.022*** (0.002)	0.022*** (0.002)
Race	1.710*** (0.491)	2.206*** (0.469)	0.848*** (0.240)	1.002*** (0.233)	0.647† (0.330)	0.797* (0.326)	-0.170 (0.205)	-0.164 (0.208)
Married	0.539** (0.204)	0.244 (0.202)	-0.090 (0.104)	-0.249* (0.104)	-0.037 (0.145)	-0.172 (0.145)	0.098 (0.083)	0.094 (0.085)
Log income	-0.175 (0.172)	-0.121 (0.166)	-0.370*** (0.088)	-0.349*** (0.085)	-0.413*** (0.121)	-0.397*** (0.119)	-0.300*** (0.070)	-0.300*** (0.070)
Education	0.510*** (0.103)	0.380*** (0.101)	0.151** (0.054)	0.085 (0.053)	0.266*** (0.073)	0.201** (0.073)	0.010 (0.043)	0.008 (0.044)
Anglican ^a	-1.261*** (0.252)	-1.214*** (0.243)	0.613*** (0.129)	0.634*** (0.125)	0.044 (0.177)	0.074 (0.174)	0.170 (0.104)	0.170 (0.104)
UCC ^a	-0.954*** (0.236)	-0.987*** (0.228)	0.234† (0.120)	0.235* (0.116)	-0.269 (0.165)	-0.264 (0.162)	0.387*** (0.097)	0.386*** (0.097)
Lutheran ^a	-0.978* (0.400)	-1.182** (0.387)	0.444* (0.206)	0.351† (0.120)	-0.050 (0.282)	-0.142 (0.278)	0.449** (0.165)	0.446** (0.166)
Baptist ^a	-1.113* (0.489)	-1.305** (0.472)	0.996** (0.303)	1.006*** (0.293)	-0.077 (0.395)	-0.070 (0.388)	0.861*** (0.203)	0.858*** (0.203)
Presbyterian ^a	-2.353*** (0.558)	-2.586*** (0.539)	0.866*** (0.243)	0.862*** (0.235)	-0.697* (0.335)	-0.692* (0.329)	0.803*** (0.223)	0.806*** (0.224)

(Continued)

Table 1. (Continued)

	Church attendance		Read Bible		Pray		Watch Relig TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Other denominations ^a	0.700* (0.350)	0.362 (0.341)	1.028*** (0.181)	0.844*** (0.177)	-0.064 (0.277)	-0.221 (0.274)	0.179 (0.159)	0.175 (0.161)
Belief JC no doubt	2.154*** (0.201)	1.883*** (0.198)	0.799*** (0.102)	0.657*** (0.101)	1.548*** (0.140)	1.405*** (0.140)	0.555*** (0.082)	0.552*** (0.084)
Belief JC some doubts	1.048*** (0.224)	1.093*** (0.216)	0.460*** (0.113)	0.470*** (0.109)	0.859*** (0.157)	0.858*** (0.154)	0.269*** (0.092)	0.270*** (0.092)
Parental religiosity	0.330*** (0.070)	0.274*** (0.068)	0.207*** (0.036)	0.185*** (0.035)	0.254*** (0.050)	0.224*** (0.049)	0.088*** (0.029)	0.087*** (0.029)
Relig. human capital		0.244*** (0.036)		0.122*** (0.019)		0.124*** (0.026)		0.003 (0.016)
Constant	-0.145 (1.641)	-1.133 (1.590)	1.996* (0.831)	1.644* (0.805)	3.223** (1.151)	2.937** (1.133)	2.030** (0.665)	2.02** (0.668)
R-squared	0.393	0.436	0.314	0.360	0.345	0.368	0.310	0.310
Adjusted R-squared	0.377	0.421	0.297	0.343	0.328	0.351	0.293	0.292

†p < .10; * p < .05; ** p < .01; *** p < .001

N = 607

^aCompared with "Catholic."

for attending church. Moreover, the adjusted R-squared values show that adding RHC to the models helps explain roughly 4.4 percent of the variation in church attendance, 4.6 percent of the variation in reading the Bible, and 2.3 percent of the variation in prayer.

Table 2 provides the cross-sectional regression results for 1990, which are fairly consistent with the results from 1975. Individuals who know the second book of the Bible and know who denied Jesus Christ have higher levels of church attendance, Bible reading, and prayer. As with the 1975–1980 results, the RHC variables do not significantly affect the frequency of watching religious television. Older individuals overwhelmingly have higher frequencies of all four types of religious participation, whereas individuals with higher incomes have lower frequencies across all types of religious participation. Compared to Catholics, those affiliated with the Anglican, UCC, and Presbyterian denominations have lower levels of church attendance, but Anglicans, Baptists, and Lutherans have higher levels of Bible reading. Consistent with the results from 1975, those who believe in Jesus Christ as the divine son of God without doubt have significantly higher levels of all types of religious participation. While the 1975 parental religiosity index has a strong effect on religious participation, the 1990 parental attendance index only affects church attendance with the RHC variables excluded from the model; it has no significant effects on any of the other religious participation variables. These models also account for a large amount of the variation in religious participation: 58.8 percent for church attendance, 43.1 percent for bible reading, and 48.7 percent for prayer. Additionally, the adjusted R-squared values show that adding RHC to the models accounts for roughly 7.4 percent of the variation in church attendance, 8.2 percent of the variation in reading the Bible, and 5.6 percent of the variation in prayer.

Change in religious participation over time

Table 3 presents the regression results predicting change in religious participation for the 1975–1980 panel. Men attend church and watch or listen to religious television/radio more over time (from baseline time 1 levels) than do women, although men pray less frequently over time. Baseline (time 1) family income is associated with a decrease in church attendance and praying, whereas baseline education is associated with an increase in church attendance and praying and a decrease in watching or listening to religious television/radio. UCC, Lutheran, Baptist, and “other” denominations read the Bible more over time compared to Catholics; however, Anglican, UCC, Lutheran, Presbyterian, and “other” denominations pray less over time

Table 2. OLS unstandardized regression coefficients predicting time | dependent variables, Project Canada 1990

	Church attendance		Read Bible		Pray		Watch relig. TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Sex	-0.52 * (0.220)	-0.235 (0.207)	-0.218 † (0.122)	-0.092 (0.116)	-0.434 ** (0.167)	-0.310 † (0.161)	-0.106 (0.077)	-0.108 (0.078)
Age	0.041 *** (0.007)	0.019 ** (0.007)	0.018 *** (0.004)	0.008 * (0.142)	0.034 *** (0.005)	0.022 *** (0.005)	0.018 *** (0.002)	0.018 *** (0.003)
Race	0.447 (0.886)	0.531 (0.824)	-0.027 (0.492)	-0.112 (0.463)	-0.194 (0.671)	-0.381 (0.643)	-0.003 (0.306)	-0.046 (0.308)
Married	0.861 *** (0.234)	0.748 *** (0.212)	0.050 (0.123)	-0.006 (0.122)	0.367 * (0.177)	0.311 † (0.169)	0.186 * (0.082)	0.186 * (0.082)
Log income	-0.179 (0.165)	-0.351 * (0.154)	-0.108 (0.091)	-0.184 * (0.086)	-0.146 (0.125)	-0.220 † (0.120)	-0.193 *** (0.058)	-0.192 ** (0.059)
Education	0.305 *** (0.085)	0.148 † (0.082)	0.090 † (0.047)	0.004 (0.046)	-0.004 (0.065)	-0.102 (0.064)	0.011 (0.030)	0.006 (0.301)
Anglican ^a	-0.263 (0.307)	-0.691 * (0.298)	0.427 * (0.170)	0.310 † (0.168)	-0.099 (0.232)	-0.128 (0.233)	-0.149 (0.107)	-0.118 (0.113)
UCC ^a	-0.747 ** (0.267)	-0.851 *** (0.255)	0.199 (0.148)	0.228 (0.143)	-0.368 † (0.202)	-0.256 (0.199)	-0.210 * (0.093)	-0.181 † (0.097)
Lutheran ^a	0.032 (0.492)	0.127 (0.463)	0.268 (0.273)	0.430 † (0.260)	-0.264 (0.372)	0.010 (0.361)	-0.038 (0.172)	0.004 (0.175)
Baptist ^a	0.592 (0.476)	-0.569 (0.469)	1.457 *** (0.264)	0.984 *** (0.263)	0.487 (0.360)	0.077 (0.366)	0.047 (0.166)	0.070 (0.177)
Presbyterian ^a	-1.320 ** (0.458)	-1.396 ** (0.426)	0.189 (0.255)	0.212 (0.239)	-0.508 (0.347)	-0.431 (0.332)	0.043 (0.160)	0.063 (0.161)

Table 2. (Continued)

	Church attendance		Read Bible		Pray		Watch relig. TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Other denominations ^a	1.421*** (0.374)	0.407 (0.382)	1.738*** (0.207)	1.386*** (0.213)	0.693* (0.283)	0.427 (0.298)	0.091 (0.130)	0.128 (0.144)
Belief JC no doubt	2.837*** (0.263)	2.285*** (0.253)	0.796*** (0.146)	0.510*** (0.142)	2.022*** (0.199)	1.700*** (0.197)	0.223* (0.092)	0.211* (0.096)
Belief JC some doubts	1.131*** (0.278)	0.755** (0.26)	0.0251 (0.154)	-0.158 (0.147)	0.946*** (0.210)	0.754*** (0.204)	0.016 (0.097)	0.013 (0.099)
Parental attendance	0.067** (0.023)	0.027 (0.021)	0.003 (0.013)	-0.015 (0.012)	0.018 (0.017)	0.001 (0.236)	0.007 (0.008)	0.007 (0.008)
Missing parental attendance	-0.168 (0.326)	-0.331 (0.302)	0.024 (0.181)	-0.035 (0.17)	0.026 (0.247)	-0.018 (0.878**)	0.096 (0.114)	0.102 (0.088)
Who denied Christ		0.856*** (0.199)		0.633*** (0.111)				
Second book of Bible		1.423*** (0.240)		0.497*** (0.134)		0.324† (0.187)		
Constant	-0.140 (2.071)	2.912 (1.951)	0.095 (1.148)	1.552 (1.094)	0.574 (1.568)	2.074 (1.522)	1.267† (0.724)	1.283† (0.739)
R-squared	0.515	0.588	0.382	0.464	0.431	0.487	0.246	0.249
Adjusted R-squared	0.494	0.568	0.355	0.437	0.406	0.462	0.213	0.212

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

N = 383

^aCompared with "Catholic."

Table 3. OLS unstandardized regression coefficients predicting time 2 dependent variables, Project Canada 1975–1980

	Church attendance		Read Bible		Pray		Watch Relig. TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Sex	0.383** (0.136)	0.414** (0.139)	-0.051 (0.084)	-0.016 (0.085)	-0.413*** (0.117)	-0.428** (0.120)	0.173* (0.074)	0.258*** (0.074)
Age	-0.005 (0.005)	-0.005 (0.005)	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.004)	-0.004 (0.004)	0.009*** (0.003)	0.008*** (0.002)
Race	0.385 (0.353)	0.437 (0.356)	-0.201 (0.223)	-0.134 (0.225)	-0.194 (0.308)	-0.217 (0.310)	-0.401* (0.190)	-0.302 (0.186)
Married	-0.034 (0.158)	-0.072 (0.162)	0.090 (0.096)	0.035 (0.100)	0.422** (0.135)	0.447** (0.140)	-0.063 (0.086)	-0.160† (0.086)
Log income	-0.299* (0.131)	-0.297* (0.131)	0.029 (0.082)	0.025 (0.082)	-0.446*** (0.113)	-0.450*** (0.113)	-0.122† (0.073)	-0.109 (0.071)
Education	0.218** (0.083)	0.206* (0.083)	-0.010 (0.051)	-0.025 (0.051)	0.213** (0.069)	0.222** (0.070)	-0.070 (0.043)	-0.116** (0.043)
Anglican ^a	-0.348† (0.196)	-0.350† (0.196)	0.097 (0.121)	0.116 (0.121)	-0.469** (0.166)	-0.470** (0.166)	-0.379*** (0.104)	-0.356*** (0.101)
UCC ^a	-0.140 (0.180)	-0.145 (0.180)	0.359** (0.112)	0.365** (0.111)	-0.468** (0.155)	-0.466** (0.155)	-0.129 (0.097)	-0.125 (0.095)
Lutheran ^a	-0.047 (0.326)	-0.071 (0.326)	0.489* (0.190)	0.469* (0.190)	-0.589* (0.263)	-0.573* (0.264)	-0.108 (0.166)	-0.174 (0.162)
Baptist ^a	-0.481 (0.374)	-0.511 (0.375)	0.846*** (0.235)	0.836*** (0.235)	-0.554 (0.410)	-0.554 (0.410)	0.113 (0.261)	0.125 (0.254)
Presbyterian ^a	-0.446 (0.367)	-0.458 (0.368)	0.317 (0.226)	0.336 (0.225)	-0.570† (0.313)	-0.563† (0.314)	0.555** (0.199)	0.556** (0.193)
Other denominations ^a	0.340 (0.288)	0.306 (0.290)	0.595** (0.183)	0.570** (0.183)	-0.706** (0.231)	-0.683** (0.234)	-0.290* (0.143)	-0.420** (0.141)

Table 3. (Continued)

	Church attendance		Read Bible		Pray		Watch Relig. TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Belief JC no doubt	0.483** (0.164)	0.463** (0.165)	0.330*** (0.099)	0.306** (0.100)	0.422** (0.143)	0.438** (0.145)	0.252** (0.084)	0.152† (0.084)
Belief JC some doubts	0.456** (0.171)	0.463** (0.171)	0.009 (0.105)	0.020 (0.105)	0.447** (0.149)	0.443** (0.149)	0.129 (0.092)	0.128 (0.090)
Parental religiosity	0.124* (0.055)	0.119* (0.055)	0.020 (0.034)	0.016 (0.034)	0.016 (0.047)	0.018 (0.045)	-0.041 (0.029)	-0.061* (0.029)
Relig. human capital		0.032 (0.029)		0.038* (0.018)		-0.017 (0.025)		0.088*** (0.015)
Time Church attendance	0.774*** (0.031)	0.767*** (0.032)						
Time Read Bible			0.590*** (0.037)	0.569*** (0.038)				
Time Pray					0.700*** (0.037)	0.704*** (0.038)		
Time Watch relig. TV							0.449*** (0.041)	0.447*** (0.040)
Constant	1.311 (1.242)	1.253 (1.243)	-0.494 (0.773)	-0.531 (0.771)	4.145*** (1.067)	4.202*** (1.071)	1.832*** (0.681)	1.607* (0.664)
R-squared	0.679	0.680	0.460	0.464	0.565	0.565	0.357	0.393
Adjusted R-squared	0.671	0.671	0.445	0.448	0.553	0.553	0.340	0.375

†p < .10; * p < .05; ** p < .01; *** p < .001

N = 607

*Compared with "Catholic."

compared to Catholics. Believing in Jesus Christ as the divine son of God without doubt is associated with increases in all four religious participation variables, whereas believing in Jesus Christ as divine with some doubts is only associated with increases in church attendance and praying from baseline levels. Parental religiosity increases church attendance and decreases watching or listening to religious television/radio over time, but has no statistically significant effect on reading the Bible and praying. RHC is associated with an increase in reading the Bible and watching religious television from baseline levels, but does not significantly affect attending church and praying. Past religious participation is, understandably, a strong determinant of future religious participation. Yet even with such a powerful predictor in the models, RHC still has significant positive effects on two of the religious participation variables, which accounts for some of their unexplained variation (0.3 percent for reading the Bible and 3.5 percent for watching/listening to religious television/radio, see adjusted R-squared).

Since RHC is measured by biblical knowledge, it should logically have the strongest effect on reading the Bible, watching or listening to religious television/radio, and church attendance, activities that are likely to utilize biblical knowledge. Given this, the lack of a significant effect of RHC on future religious attendance is peculiar. However, the underlying logic of the hypothesis is that RHC should increase church attendance by increasing the benefits of or returns from attendance. This means that for RHC to have an effect it must be utilized. Given that most Christian church services focus more on beliefs, practices, and biblical readings from the New Testament, Old Testament knowledge may be less useful and result in fewer returns from attendance. The RHC index primarily includes Old Testament biblical knowledge questions, but it also includes two binary questions that draw on knowledge of the New Testament—"is Paul an Old Testament prophet?" and "who denied Christ three times?" I re-estimated the longitudinal church attendance regression model with these binary variables in place of the RHC index. Results from this model are presented in Table 4. Unlike the previous model, the Paul measurement of RHC is significantly associated with an increase in church attendance.

Table 5 provides the 1990–1995 regression results predicting change in religious participation. As with the results from the 1975–1980 panel, men attend church more over time (from baseline time 1 levels) compared to women. Family income is associated with a decrease in church attendance and education is associated with a decrease in watching religious television over time. There are fewer significant differences between Catholics and Protestant denominations in this panel. Notably, compared to Catholics, Lutherans pray and Baptists watch religious television more frequently over

Table 4. OLS unstandardized regression coefficients predicting time 2 church attendance, Project Canada 1975–1980

Sex	0.438*** (0.138)
Age	-0.004 (0.005)
Race	0.478 (0.354)
Married	-0.076 (0.159)
Log income	-0.304* (0.131)
Education	0.194* (0.083)
Anglican ^a	-0.390* (0.196)
UCC ^a	-0.185 (0.181)
Lutheran ^a	-0.113 (0.326)
Baptist ^a	-0.572 (0.376)
Presbyterian ^a	-0.515 (0.367)
Other denominations ^a	0.251 (0.290)
Belief JC no doubt	0.432*** (0.166)
Belief JC some doubts	0.468*** (0.171)
Parental religiosity	0.110* (0.055)
Who denied Christ	0.139 (0.142)
Paul	0.256† (0.135)
Time 1 Church attendance	0.753*** (0.032)
Constant	1.275 (1.245)
R-squared	0.683
Adjusted R-squared	0.673

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

$N = 607$

^aCompared with "Catholic."

Table 5. OLS unstandardized regression coefficients predicting time 2 dependent variables, Project Canada 1990–1995

	Church attendance		Read Bible		Pray		Watch relig. TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Sex	0.350* (0.171)	0.430* (0.169)	-0.070 (0.137)	0.011 (0.135)	-0.134 (0.139)	-0.062 (0.137)	-0.124 (0.096)	-0.063 (0.095)
Age	-0.005 (0.005)	-0.011* (0.006)	0.004 (0.004)	-0.003 (0.004)	0.003 (0.004)	-0.003 (0.005)	0.015*** (0.003)	0.010** (0.003)
Race	-0.428 (0.682)	-0.442 (0.674)	0.225 (0.550)	0.214 (0.542)	-0.602 (0.555)	-0.701 (0.541)	0.080 (0.380)	0.063 (0.375)
Married	-0.241 (0.184)	-0.233 (0.181)	0.292* (0.145)	0.254† (0.143)	-0.127 (0.148)	-0.146 (0.143)	0.070 (0.102)	0.047 (0.101)
Log Income	-0.276* (0.127)	-0.355*** (0.127)	-0.032 (0.102)	-0.103 (0.102)	-0.057 (0.103)	-0.128 (0.102)	-0.204*** (0.073)	-0.243*** (0.072)
Education	0.128† (0.067)	0.075 (0.067)	0.069 (0.053)	0.017 (0.054)	0.042 (0.054)	-0.030 (0.054)	-0.041 (0.037)	-0.079* (0.038)
Anglican ^a	-0.261 (0.237)	-0.394 (0.246)	0.121 (0.192)	0.026 (0.197)	0.151 (0.192)	0.073 (0.196)	0.218 (0.134)	0.148 (0.138)
UCC ^a	-0.105 (0.208)	-0.142 (0.212)	-0.105 (0.166)	-0.105 (0.168)	-0.102 (0.168)	-0.083 (0.168)	0.036 (0.117)	0.035 (0.118)
Lutheran ^a	-0.161 (0.379)	-0.044 (0.379)	0.276 (0.305)	0.369 (0.305)	0.557† (0.308)	0.693* (0.304)	0.037 (0.214)	0.093 (0.213)
Baptist ^a	0.251 (0.367)	-0.138 (0.385)	0.144 (0.307)	-0.121 (0.314)	0.428 (0.299)	0.096 (0.308)	0.642** (0.206)	0.406† (0.215)

Table 5. (Continued)

	Church attendance		Read Bible		Pray		Watch relig. TV	
	coefficient (SE)		coefficient (SE)		coefficient (SE)		coefficient (SE)	
Presbyterian ^a	-0.108 (0.357)	-0.186 (0.354)	-0.080 (0.285)	-0.073 (0.280)	-0.208 (0.288)	-0.213 (0.281)	-0.025 (0.199)	-0.025 (0.196)
Other denominations ^a	-0.060 (0.294)	-0.311 (0.313)	-0.224 (0.253)	-0.390 (0.264)	-0.024 (0.236)	-0.247 (0.252)	0.173 (0.161)	-0.019 (0.175)
Belief JC no doubt	-0.245 (0.232)	-0.309 (0.229)	0.632*** (0.169)	0.499*** (0.169)	0.579*** (0.186)	0.480*** (0.182)	0.151 (0.115)	0.021 (0.117)
Belief JC some doubts	-0.080 (0.219)	-0.165 (0.216)	0.342* (0.173)	0.206 (0.172)	0.442* (0.177)	0.359* (0.175)	-0.006 (0.121)	-0.091 (0.121)
Parental attendance	0.018 (0.018)	0.007 (0.018)	0.024† (0.014)	0.010 (0.014)	0.006 (0.014)	-0.008 (0.014)	0.010 (0.010)	0.001 (0.010)
Missing parental attendance	0.514* (0.251)	0.440† (0.248)	-0.089 (0.202)	-0.140 (0.199)	0.236 (0.204)	0.194 (0.199)	0.129 (0.142)	0.100 (0.139)
Who denied Christ		0.508*** (0.167)		0.371*** (0.136)		0.568*** (0.136)		0.259*** (0.092)
Second book of Bible		0.463* (0.206)		0.470*** (0.160)		0.355* (0.159)		0.265* (0.111)
Time 1 Church attendance	0.946*** (0.040)	0.882*** (0.043)						

(Continued)

Table 5. (Continued)

	Church attendance	Read Bible	Pray	Watch relig. TV
	coefficient (SE)	coefficient (SE)	coefficient (SE)	coefficient (SE)
Time Read Bible		0.803 ^{***} (0.058)		
		0.710 ^{***} (0.061)		
Time Pray			0.751 ^{***} (0.043)	0.682 ^{***} (0.044)
Time Watch relig. TV				0.834 ^{***} (0.065)
Constant	3.626* (1.594)	-0.450 (1.283)	1.304 (1.297)	2.202* (0.904)
R-squared	0.754	0.531	0.653	0.522
Adjusted R-squared	0.743	0.509	0.637	0.500

†p < .10; * p < .05; ** p < .01; *** p < .001

N = 383

^aCompared with "Catholic."

time. Believing in Jesus Christ as the divine son of God without doubt is associated with an increase in reading the Bible and praying, whereas believing in Jesus Christ as divine with some doubts is only associated with an increase in praying. Parental attendance does not significantly affect any of the religious participation variables in the full models. Both RHC variables are associated with an increase in all four of the religious participation variables. The adjusted R-squared values show that the two RHC variables together explain 0.9 percent of the variation in church attendance, 2.1 percent of the variation in reading the Bible, 2.2 percent of the variation in praying, and 2 percent of the variation in watching religious television.

Discussion

Overall, the results provide support for RHC theory. In the 1975 and 1990 cross-sectional models, higher levels of RHC are associated with higher frequencies of church attendance, Bible reading, and praying from baseline levels. In the 1975 longitudinal models, higher levels of RHC are associated with an increase in Bible reading and watching or listening to religious television/radio from baseline levels and New Testament RHC (as measured by knowledge of Paul) is associated with an increase in church attendance from the baseline level. The latter provides further support for the theoretical rationale behind RHC, since only RHC used within church services should have an effect on future church attendance. This suggests that while some RHC may increase religious participation, not all RHC will necessarily have the same effect. In the 1990 longitudinal models, the RHC variables are associated with an increase in all types of religious participation, further supporting RHC theory.

It is important to note that RHC exhibited significant positive effects on religious participation, controlling for denominational affiliation, a religious belief measure, and parental religiosity/attendance. The strong positive effect on religious participation of belief in Jesus Christ as the divine son of God without doubt provides support for Montgomery's (1996) argument regarding the importance of religious belief and certainty for explaining differential religious participation (see also Bruce, 1993, 1999). To the extent that belief in Jesus Christ serves as a proxy for religious preference (as belief in the Bible did in Sherkat and Wilson, 1995), this finding may also support the preference adaptivity theory of religious participation (Sherkat, 1997). There do appear to be some differences in religious participation over time between Catholics and Protestant denominations, especially in the 1975–1980 panel. Given that religious affiliations represent a “package” of certain religious beliefs, practices, and organizational

structures, these findings suggest that a religious preference for a specific type of religious “package”/affiliation may also explain differential religious participation over time.

The different effects of parental religious influence on religious participation across the two panels can be explained through how the variables were measured. The parental religiosity index (1975–1980 panel), as measured by a respondent’s parents’ current level of religiosity, is consistent with Stark and Finke’s (2000) conception of religious social capital as distinct from RHC and as having its own effect on religious participation through social influence mechanisms (Sherkat, 1997). Thus, including RHC in the model should not influence the positive effect that parental religiosity has on religious participation. On the other hand, the 1990–1995 panel measured parental religious influence in a way more consistent with Iannaccone’s (1990) conception of RHC; that is, as parental church attendance during respondent’s childhood. Iannaccone (1990) predicts that parental church attendance during childhood should increase an individual’s stock of RHC and thereby increase her future religious participation. Consequently, controlling for RHC, the parental attendance index should not have a significant effect on religious participation, which is supported by the results. In fact, when RHC is not included in the 1990 cross-sectional models, parental church attendance during childhood does have a significant positive effect on religious participation, as previous studies have found. These models suggest that religious social capital matters not only due to increasing one’s RHC, as in the 1990–1995 panel, but also through other mechanisms, such as possibly sanctions, sympathy, identity, or example-setting (Sherkat, 1997; see also Kitts, 2000), as suggested by the 1975–1980 panel. This highlights how different operationalizations of religious social capital may result in disparate effects, and emphasizes the importance of having a solid theoretical grounding for how one chooses to measure religious social capital.

The overall finding that RHC increases religious participation does not negate the effects of preferences, beliefs, or social influence. In this sense, the findings do not counter the preference adaptivity (Sherkat, 1997) and cognitive dissonance theories of religious participation (Montgomery, 1996). Rather, they provide clear support for Iannaccone’s (1990) RHC theory, which previous research using proxy measures has been unable to do. Beliefs and preferences do partly explain increases in religious participation, but importantly, this study suggests that RHC does as well. Thus, RHC theory provides a supplementary explanation for changes in religious participation over time.

Unlike past research, this study used a direct measure of RHC, religious knowledge (i.e., biblical knowledge), to test a hypothesis derived

from RHC theory (Iannaccone, 1990). Religious knowledge as a unique dimension of religiosity is not without precedent. The social scientific study of religion has a long history of understanding religion as a multi-dimensional concept, typically including an intellectual dimension (i.e., religious knowledge) (Davidson, 1975; De Jong et al., 1976; Faulkner and De Jong, 1966; Fukuyama, 1961; Glock, 1962; Hilty et al., 1984; Hilty and Stockman, 1986; King and Hunt, 1972a; Stark and Glock, 1968). While some studies have attempted to measure religion with an intellectual dimension, most still focus on religious belief and ritualistic dimensions, and some exclude the intellectual dimension altogether (Gibbs and Crader, 1970).

RHC theory (Iannaccone, 1990) provides theoretical reasons why religious knowledge should be an important dimension of religion and suggests how it should be related to other dimensions. This study focuses on the effect of religious knowledge on changes in religious participation over time, but this theoretical approach provides additional leverage for understanding other types of religious phenomena. Religious traditions require varying amounts of religious knowledge; requiring large amounts of religious knowledge may serve as a barrier to entry for those who lack the knowledge, but also a barrier to exit once individuals gain the knowledge and find they have much to lose by leaving (Finke, 2004; Iannaccone, 1990; Stark and Finke, 2000; Verter, 2003). Additionally, not all religious knowledge is easily transferable. Some religious knowledge is specific to a certain religious denomination or tradition, which may also affect conversion and exit rates (Abel, 2005; Finke, 2004). Furthermore, macro-level religious supply factors, such as the regulation or repression of religion, can affect the distribution of RHC in a society. (Froese, 2001, 2008; Froese and Pfaff, 2001, 2005). Long-term declines in RHC acquisition may then affect religious participation and conversion on the micro-level (Froese, 2001, 2008; Froese and Pfaff, 2001, 2005).

Conclusions

Iannaccone's (1990) theory of religious human capital (RHC) proposed the hypothesis that RHC increases religious participation. Most prior studies relied on proxy measures of RHC to test this and other propositions derived from the theory. Since these proxy measures are predicted by other theories to affect religious participation, past research has been unable to provide unambiguous support for Iannaccone's (1990) theory. This study is the first to test the hypothesis using a direct measure of RHC (i.e., biblical knowledge). The results show that biblical knowledge is associated with increases

in certain types of religious participation, even controlling for parental religious influence, denominational affiliation, and religious belief. This suggests that differential religious participation is explained by more than just preference adaptation (see Sherkat, 1997) or cognitive dissonance reduction (see Montgomery, 1996) and that RHC theory supplements these other explanations. However, the results also suggest that some types of RHC may have a greater effect on certain religious activities.

The present study is not without limitations. First, the data is drawn from one country (i.e., Canada) and one religion (i.e., Christianity, both Protestantism and Catholicism). This is fairly consistent with past studies on RHC, which also generally focused on one religious tradition—Christianity (Finke and Dougherty, 2002; Froese, 2001, 2008; Iannaccone, 1990), Judaism (Abel, 2005; Sands, 2009), or Catholicism (Brañas-Garza and Neuman, 2006); and one country—the United States (Abel, 2005; Finke and Dougherty, 2002; Iannaccone, 1990; Sands, 2009) or Spain (Brañas-Garza and Neuman, 2006). This study diverges from most previous RHC research by using data from Canada, rather than the United States; in doing so it suggests the applicability of RHC theory to a country with a very different religious landscape, thereby contributing to the generalizability of the theory. Moreover, because religious knowledge tends to be specific to one religion (Iannaccone, 1990), directly measuring it will typically require a sample restricted to one religious tradition. As such, the findings should be generalized with caution to other religious traditions and countries. Although a more diverse country and religious tradition sample would be preferable, the findings offer support for RHC theory beyond the ambiguous results of previous studies using proxy measures. Because RHC theory is a general theory that is expected to be applicable to all religions and locales, this study contributes to the literature by providing a direct approach to measuring RHC, which can be utilized in future research to test the generalizability of the theory with samples of other religious traditions and countries. Moreover, because the study focused on testing one general hypothesis from RHC theory, it was beyond the scope of the paper to investigate more historically specific or contingent hypotheses, as Beyer (1998) proposes. While this study suggests that biblical knowledge is associated with higher levels of religious participation in Canada during two time periods (1975–1980 and 1990–1995), additional research is needed to determine whether the theory can explain religious participation under different historical and geographic conditions. Research would also benefit from more detailed historical studies, like Froese (2001, 2008) and Froese and Pfaff (2001, 2005), which contextualize RHC theory within particular historical contexts.

A second limitation is that the panel data comes from surveys conducted at five-year intervals. Because the study examines changes in religious participation over time, it was necessary for the time lag between the surveys to be large enough to allow for sufficient changes in participation. While the five-year interval provides the necessary time for changes to occur, it also creates a longer lag between when RHC is measured (in time 1) and the dependent variable it is predicting (time 2). Because RHC is “learned by doing,” it may vary by age, as older individuals have had a longer period of time to accumulate RHC (Iannaccone, 1990). However, controlling for the most important determinants of RHC (Iannaccone, 1990)—past religious participation, parental religiosity/attendance, and age—helps reduce this potential bias. Moreover, the longitudinal approach of the current study provides an advantage over cross-sectional past studies by showing how a measure of RHC is associated with changes in religious participation over time.

A third limitation is in the measurement of RHC. While religious knowledge is a core component of RHC, this study measured religious knowledge based only on a specific subset of it—biblical knowledge—using six (for the 1975–1980 panel) and two (for the 1990–1995 panel) items to operationalize it. While more items would be preferable, most past research on religious knowledge, or biblical knowledge specifically, uses anywhere from two to five items (Davidson, 1975; Finney and Lee, 1977; Fukuyama, 1961; Glock, 1962) up to eight or more (De Jong et al., 1976; King and Hunt, 1972a). Although this direct measure of RHC has many advantages over the proxy measures used in past research (e.g., being able to disentangle the effects of RHC from the effects of religious beliefs and social relationships), further research should draw on a more extensive array of items and investigate whether other types of RHC produce similar findings. Thus, the results should be interpreted with caution: RHC is a broad concept and biblical knowledge is just one subset of it, and is measured by a limited number of items. Furthermore, this study only tests the effect of biblical knowledge on religious participation, not its effect on other variables (e.g., intangible goods such as satisfaction, enjoyment, or other types of rewards or gains) or the recursive relationship, which is left for future studies. Since some past research has regarded religious knowledge as a weak element of religiosity (Gibbs and Crader, 1970; King and Hunt, 1972b), more research is needed with regard to the effect of religious knowledge on various religious outcomes to further support its relevance. While it has its limitations, this paper provides a first step for suggesting the importance of RHC for explaining religious participation, and offers several theoretical extensions

for testing the effect of RHC on other dependent variables and other samples, providing grounds for future research.

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Notes

1. Likewise, these theories may be able to explain differential religious participation among individuals with high levels of RHC.
2. Some scholarly work draws a distinction between religious capital, as highly institutionalized capital within the constraints of a given religious tradition (Verter, 2003), and “spiritual capital,” which includes spiritual knowledge and competencies and is more in line with a definition of spirituality: “an extrainstitutional, resolutely individualistic, and often highly eclectic personal theology, self-consciously resistant to dogma” (Verter, 2003: 158). While Verter (2003: 157–158) is correct that “I’m not religious but I’m spiritual” is a “common locution,” whether a scholarly distinction between religious and spiritual capital is necessary depends on whether there is a theoretical distinction between the two concepts. Wuthnow’s (2000: 128) usage of spiritual capital incorporates elements of both of these terms, as spiritual capital is generated from “activities that have a specific religious emphasis” or those “that are explicitly concerned with relating people to the sacred or divine.” Although other scholars may have theoretical reasons for distinguishing between these two concepts, Iannaccone’s (1990) RHC framework does not require such a distinction. Whether the “religious” skills and knowledge accumulated by individuals are accrued within institutionalized religious contexts or within a more spiritual, individualistic, extrainstitutional setting, the prediction that RHC should increase religious (or spiritual) participation through increasing returns applies in both cases. Therefore, the definition of RHC used in this study makes no distinction between religious and spiritual capital and allows what is generally considered “spiritual” knowledge and skills to be included within the definition.
3. In addition to excluding social ties from the definition of RHC, Stark and Finke (2000) added “emotional attachment” to their definition. Since Iannaccone’s

(1990) RHC theory predicts that RHC should increase the enjoyment or satisfaction individuals receive from religious participation, the theory necessarily separates RHC from a type of emotion (i.e., enjoyment, satisfaction, appreciation, and so on). Wuthnow (2000) also distinguishes “emotional capital” from “spiritual capital,” which suggests that emotional attachment should be viewed as its own distinct type of capital. Accordingly, the definition of RHC used in this study excludes emotional attachment.

4. In response to Sherkat’s (1997) criticism, Iannaccone (1995: 118) provides a formal sketch of how his model is able to incorporate preference change overtime as a result of past experience. If C_t denotes the effects of all past experience up through period t , such as “one’s religious upbringing, exposure to different religions, ties to fellow congregants”, and RHC, then one’s current stock of C is a function of past time investment, purchased goods, interactions, and stock from the previous period: $C_t = F(T_{t-1}, X_{t-1}, S_{t-1})$. By expanding the timespan to earlier periods, “one finds that today’s stock [.. of C] depends on the religious participation and interactions in all previous periods” (Iannaccone, 1995: 118). To let this stock contribute to changing preferences/tastes, C can be directly entered into the individual’s utility function: $U_t = U(R_t, C_t)$ (Iannaccone, 1995: 118).
5. Montgomery (1996: 443) proposes that religious participation should be viewed “as an attempt to maximize expected utility given subjective beliefs”. He provides a simple model to illustrate this: consider two actions $\{A_1 = \text{attend church}; A_2 = \text{do not attend church}\}$, two states of nature $\{S_E = \text{God exists}; S_N = \text{God does not exist}\}$, the [religious] beliefs $\{p_E, p_N\}$, and the utilities $\{u_{1E}, u_{1N}, u_{2E}, u_{2N}\}$; the analysis would then assume that the actor chooses the action A_i that generates the highest expected utility $\sum_j p_j u_{ij}$. While it is behind the scope of the current study to directly test Montgomery’s (1996) model, because his model proposes the importance of religious beliefs for affecting religious participation, a measure of religious beliefs is controlled for in all statistical models presented.
6. One’s beliefs and dissonant behavior can also be reconciled by refraining from participating in the dissonant behavior, thereby retaining one’s beliefs.
7. The data was downloaded from the Association of Religion Data Archives, www.TheARDA.com, and was originally collected by Reginald W. Bibby.
8. According to Devellis’ (1991: 85) guidelines for Cronbach’s alphas, an alpha between .65 and .70 is minimally acceptable.
9. Due to the nature of the dependent variables, I also estimated ordinal logistic and probit regression models (results not shown). Because the results of these models are consistent with the OLS regression models, the OLS models are displayed for ease of interpretation, comparability across models, and parsimony.
10. A propensity score “is essentially the conditional probability that a person or household responds given the covariates” (Wun et al., 2007: 1876).
11. The amount trimmed from the weights “is divided among the observations that were not trimmed, so that the total weight remains the same” (Lumley, 2010).

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