Family Formation, Educational Attainment, and Religion:

Longitudinal Approaches to Religious Change

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
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ABSTRACT

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Abstract

Research into how different life events shape individual religiosity has a long history within sociology. However, some scholars have begun to question whether research in this area has methodologically justified making strong causal claims. In an effort to re-center religion within the field of sociological concerns, quantitative sociologists of religion have tended to overstate the meaning of their statistical relationships, and this has led to many of their causal assumptions being unstated and/or untested in their analyses. Advances in causal statistical modeling and counterfactually-grounded analyses have led to the development of statistical models that are better able to establish causal relationships. It is time to begin implementing these approaches within the sociology of religion. This more rigorous statistical approach runs the risk of demonstrating that social life's influence on religion may be less impressive than was previously thought. But researchers in this area must take this risk to develop a better sense of the real effects of society on religion. This in turn will provide a better foundation for developing theories of religion's role in our modern world.

One way in which sociologists of religion can improve their causal modeling strategies is through the use of longitudinal data and methods. In recent years, there has been a significant increase in the availability of large-scale longitudinal data that collects

information on respondents' religious beliefs, practices, and belongings. With these data, scholars interested in religious change can move away from their reliance on comparing individuals to one another – a constraint of cross-sectional data – and begin to analyze how certain life course events may lead to changes in individual religiosity. I revisit two important areas within the sociology of religion –the relationship between family formation and religious service attendance and the effects of educational achievement on religious beliefs and practices – to assess whether these relationships can be considered causal in light of results from longitudinal statistical models. By implementing longitudinal models, I am able to assess directly whether between-individual differences or individual change over time is driving the statistical relationships found in my analyses. I will show that the story we thought we knew about how religion responds to family formation and educational attainment changes when these additional statistical tests are brought to bear on the data.

Dedication

I dedicate my dissertation to my grandfather, Cyrus Schleifer. A good man and a hard name to live up to.

Contents

List of Tables

List of Figures

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1. Longitudinal Models in the Sociology of Religion: Towards a Better Causal Strategy

Research into how different life events shape individual religiosity has a long history within sociology (Weber [1904] 1946; Weber 1946; Lenski 1963; Durkheim [1912] 1995; Weber [1905] 2003; Weber 1969). However, it really began to flourish around the mid-1980s. This was surprising, primarily because the predominant theory within the field at this time was secularization theory (Berger 1967b; Martin 1978; Dobbelaere 1981; Tschannen 1991; Warner 1993). This theory predicted that religion's influence in the social world would decline in the face of modernizing pressures (Chaves 1994). It was in the mid-1980s, however, that religion reemerged within the public sphere (Casanova 1994), as exemplified by the rise of evangelicals in American politics (Liebman and Wuthnow 1983; Hunter 1987; Bruce 1988), the Iranian Revolution (Arjomand 1988; Riesebrodt 1993; Kurzman 2004), and the growth of Pentecostalism in the global south (Blumhofer 1993; Hollenweger 1997; Wacker 2001; Jenkins 2011).

This reemergence led to a proliferation of research that looked at religion as a causal predictor as well as religion as a causal outcome as sociologists began to reassert the importance of religion as a form of social identity. Research showed how religion affected voting behavior (McVeigh and Sikkink 2001; McVeigh and Maria-Elena 2009; Read and Eagle 2011), income and wealth attainment (Keister 2003; Keister 2007; Keister 2008; Keister 2011), various health outcomes (Ellison 1991; George, Ellison, and Larson 2002; Powell, Shahabi, and Thoresen 2003; Nagel and Sgoutas-Emch 2007; Proeschold-bell and Legrand 2012), and immigrants' lives (Warner and Wittner 1998; Chafetz and

Ebaugh 2000; Cadge and Howard Ecklund 2007; Wuthnow and Offutt 2008), to name just a few examples. This period also saw a growth in studies that looked at religion as a dependent variable. This research showed how starting a family shaped religious practice (Stolzenberg, Blair-Loy, and Waite 1995; Argue, Johnson, and White 1999; Edgell 2006; Mahoney, Pargament, Tarakeshwar, and Swank 2008; Heaton and Darkwah 2011; Schleifer and Chaves 2014), how education could transform religious beliefs (Hill 2011; Mayrl and Uecker 2011; McFarland, Wright, and Weakliem 2011; Schwadel 2011), and how various demographic processes shaped patterns of religious belonging (Hout, Greeley, and Wilde 2001; Hout and Fischer 2002; Loveland 2003; Lim, MacGregor, and Putnam 2010), again to name just a few examples.

Much of this work continues today, and sociology as a whole seems much more apt to consider the importance of religion across a wide variety of sociological domains. However, some scholars have begun to question whether research in this area has methodologically justified making strong causal claims about religion's role in the modern world (Chaves 2010; Desmond, Morgan, and Kikuchi 2010; Read and Eagle 2011; Uecker, Mayrl, and Stroope 2013; Schleifer and Chaves 2014). In an effort to re-center religion within the field of sociological concerns, quantitative sociologists of religion have tended to overstate the meaning of their statistical relationships, and this has led to many of their causal assumptions being unstated and/or untested in their analyses.

Advances in causal statistical modeling and counterfactually grounded analyses over the past thirty years have led to calls for greater methodological sophistication

when using observational data in efforts to establish causal relationships (Sobel 1995; Winship and Morgan 1999; Winship and Sobel 2004; Pearl 2009; Morgan and Winship 2015). Indeed, there are statistical models that are better able to establish causal relationships, and it is time to implement these approaches within the sociology of religion.

This more rigorous statistical approach runs the risk of demonstrating that religion's influence on social life may be less impressive than was previously thought. But researchers in this area must face this risk to develop a better sense of the real effects of society on religion and of religion on society. This in turn will provide a better foundation for developing theories of religion's role in our modern world.

1.1 Longitudinal Models as a Move Forward

One way in which sociologists of religion can improve their causal modeling strategies is through the use of longitudinal data and methods (Singer and Willett 2003; Allison 2005a; Allison 2009; Bollen and Brand 2010; Morgan and Winship 2015). Longitudinal data analysis is not new to sociology. Indeed, it is common in economic sociology, sociology of education, and social demographic analyses. However, until recently, there has been very little large-scale longitudinal data that collected information on respondents' religious belief, practice, and belonging. The reliance on cross-sectional data and methods forced sociologists of religion to rely on between-individual comparisons, and this has led to speculation about causal relationships, in particular when the theory under examination involves individuals changing over time. For example, if we are interested in the relationship between religious attendance and

marriage, cross-sectional data allows analysts to show that married individuals attend religious services at higher rates than non-married individuals. It does not follow, however, that getting married itself leads to higher rates of attendance. Cross-sectional data provide no access to this type of change because cross-sectional data do not track individuals over time.

Panel studies do collect information about individuals changing over time. However, longstanding sources of sociological panel data – such as the Panel Study of Income Dynamics and the National Longitudinal Study of Youth – only sporadically collect information on respondents' religious lives. Recently, sociologists have begun to collect nationally representative panel data that capture a wide variety of information about religious belief, practice, belonging, and institutions. Scholars interested in religious change now have access to The National Longitudinal Study of Adolescent Health, The National Study of Youth and Religion, and the General Social Survey rotating panel data, to name three key examples. With these data, analysts can revisit core findings within the sociology of religion and uncover whether well-established cross-sectional relationships survive the greater scrutiny of longitudinal models. In many cases, scholars can more rigorously test claims of causal relationships.

The core difference between cross-sectional and longitudinal data is that longitudinal data contain an extra type of variation. Cross-sectional data capture a snapshot of the population, and this information is well suited to distinguish differences between individuals and groups of individuals. Longitudinal data, in addition to capturing between-individual differences, also captures within-individual differences

because it collects information from the same individual at multiple time points. This additional source of variation allows analysts to track individuals as they change over time. This within-individual variation enables us to estimate a wide range of additional statistical models that can directly account for individual change. With panel data, we can move away from our reliance on comparing those who are married to those who are not, and we can begin to look at whether getting married, becoming more educated, or whatever, is associated with change in an individual's religiosity. Such fine-grained analysis of statistical associations allows analysts to determine more rigorously whether that association might or might not be truly causal.

This dissertation takes seriously the call for sociologists of religion to be more diligent when making causals claims about how life events shape individual religiosity. To that end, I revisit two important areas within the sociology of religion to determine whether long-standing cross-sectional relationships remain after using panel data to estimate appropriate statistical models. By estimating longitudinal models, I am able to directly compare the extent to which between-individual differences or individual change over time drive well-known cross-sectional relationships. I will show that the story we thought we knew about how religion responds to family formation and educational attainment changes in light of these more rigorous data and models. The following two chapters contain two separate studies, one examining how family formation affects religious service attendance, and the other examining how college degree completion affects individual religiosity.

2. Does Starting a Family make you more Religious? A Latent Curve Model approach to Family Formation and Religious Service Attendance

Family formation processes are considered important determinants of religious participation (Myers 1996; Smith and Denton 2005; Wilcox 2006; Petts 2009). Marriage, parenthood, and child age have all been associated with increased religious service attendance, particularly following declines during young adulthood (Stolzenberg, Blair-Loy, and Waite 1995; Benson and King 2006; Uecker, Regnerus, and Vaaler 2007). However, most of the research in this area relies on cross-sectional data. Analyzing cross-sectional data depends on comparing individuals who are married to those who are not, or individuals who have children to those who do not. While much has been learned from this research, increases in the availability of longitudinal data that include information about respondents' religious lives provide additional evidence about individual change (and/or stability) regarding religious participation. Analysts can now use longitudinal modeling techniques to capture the effects of within-individual change over time. With these data, we now can test whether *getting married*, *having a child*, *having additional children*, and/or *children aging* affect individual rates of religious service attendance. Instead of relying on comparing individuals – a constraint of cross-sectional data – we can now formally test whether a change in an individual's family structure is related to that individual changing his/her rate of religious participation.

Some recent research on religion and the family takes advantage of longitudinal data by implementing random-effects models (Argue, Johnson, and White 1999), lagged-variable models (Uecker, Mayrl, and Stroope 2013), and fixed- as well as hybrid-effect

models (Schleifer and Chaves 2014). These studies further our understanding of the relationship between religious practice and family formation. The current study builds on this research by using latent curve models (LCMs) to estimate changes in religious service attendance. LCMs are appealing because they test whether changes in family structure affect rates of religious service attendance beyond average changes experienced by a population. LCMs, as a class of trajectory models, move beyond the standard longitudinal approaches by accounting for variations in individuals' religious service attendance trajectories. This enables an analyst to capture the effects of marriage, parenthood, and child age beyond any underlying growth, decline, or stability in a respondent's religious attendance. For example, if the data show that young adults, on average, have declining rates of religious attendance, LCMs are able to control for this decline and further test whether young adults who get married show different rates of attendance relative to those who do not get married. This begins to address a core concern of longitudinal statistics: that the effects captured in panel models are an artifact of different starting trajectories rather than the product of the particular social change or treatment that we are studying (Morgan and Winship 2007: Ch.9).

LCMs are able to address this issue by modeling random intercepts and random slopes for each individual. This method allows each respondent to have a different starting attendance and a different attendance slope (Bollen and Curran 2006). Roos (2013) used LCMs to understand whether religious service attendance decreases the likelihood of embracing mainstream scientific narratives. He finds that attitudes toward scientific orthodoxy and rates of religious service attendance are both set during young

adulthood. I use a similar LCM on attendance to investigate whether changes in family structure affect religious service attendance beyond the average changes occurring within the population. Using General Social Survey (GSS) panel data, I use LCMs to examine the relationship between family formation and religious service attendance. I conclude by discussing my results' implications for the study of family formation processes.

2.1 Background

Family institutions and religion show a fundamental codependence (Coltrane 2001; Wilcox 2006), and forming a family seems to reverse declines in religious participation (Stolzenberg, Blair-Loy, and Waite 1995; Benson and King 2006; Uecker, Regnerus, and Vaaler 2007). Interpreting the strong cross-sectional relationship between marriage and religion as a causal connection, scholars have theorized that as young adults get married, they become more involved in religious communities to interact with other married couples (Stolzenberg, Blair-Loy, and Waite 1995), and to settle into conventional social and cultural systems that may include religious involvement (Wilcox 2006; Wuthnow 2007). Additionally, becoming a parent also shows a strong cross-sectional relationship with increased religious participation (Stolzenberg, Blair-Loy, and Waite 1995; Argue, Johnson, and White 1999; Becker and Hofmeister 2001; Uecker, Regnerus, and Vaaler 2007). Parents may return to religion to provide a structured environment for their children (Ingersoll-Dayton, Krause, and Morgan 2002), to pass on their faith (Wilcox 2006; Wuthnow 2007), and to use congregations as a source of parenting strategies (Alwin 1986; Wilcox 1998).

This research, however, has historically relied on cross-sectional data. Analyzing this type of data depends on comparing individuals, and this makes it difficult to assess whether getting married makes individuals more religiously active or if religious individuals are just more likely to get married during young adulthood. The risk of reverse causation is exemplified by the parallel body of literature that focuses on how religion impacts the timing and duration of family formation events (Lehrer and Chiswick 1993; Call and Heaton 1997; Hünler and Gençöz 2005; Brown, Orbuch, and Bauermeister 2008; Wolfinger and Wilcox 2008; Ellison, Burdette, and Wilcox 2010). This research emphasizes the positive relationship between being religious and getting married earlier (Lehrer 2000; Xu, Hudspeth, and Bartkowski 2005), more marital stability (Lehrer and Chiswick 1993; Call and Heaton 1997; Heaton 2002), and higher levels of marital quality (Heaton and Pratt 1990; Shehan, Bock, and Lee 1990; Williams and Lawler 2003; Hünler and Gençöz 2005). Additionally, individuals who regularly attend religious services tend to have children at earlier ages (Pearce 2010) and to have a greater number of children than those who are less religiously active (Hout, Greeley, and Wilde 2001; Hayford and Morgan 2008).

The increasing availability of longitudinal data allows analysts to revisit these findings with an additional set of statistical tools. Longitudinal analyses are not new to sociology, but it is only recently that large-scale longitudinal data that include information on individuals' religious lives have become widely available. With some of these new data, Argue, Johnson, and White (1999) used random- and fixed-effects models to analyze the effects of age and parenthood on religious service attendance.

Using random-effects models, they found that individuals with young children increase the frequency of attendance, net of a strong age effect. Argue et al. (1999) point out that random-effects models are more efficient than fixed-effects models because they use all the available variance in the dependent variable. This is true, but random-effects models force the within- and between-individual variation to be equal (Allison 2005; Allison 2009). This approach may allow between-individual comparisons to overwhelm any within-individual change over time, and this makes it risky to infer causation from any random-effects regression model (Schleifer and Chaves 2014).

Uecker and his colleagues (Uecker, Regnerus, and Vaaler 2007; Uecker, Mayrl, and Stroope 2013) used a lagged variable model to capture the effect of family formation on religious participation. Their analyses confirm the positive effects of marriage and parenthood on religious participation. Uecker et al. (2013) used respondents' information from time 1 to sort them into groups, and they estimated models using respondents' information from time 2. This allowed them to focus on theoretically-interesting groups to see if people in those groups increased attendance after experiencing a family-formation event. This approach is appealing because it emphasizes particular groups (for example, those with low rates of attendance) and by limiting attention to people with particular characteristics at time 1, it may account for some time dependency in religious participation. However, this approach relies on an analyst's theoretical sorting and does not model individual change directly. Instead, this approach cuts the data into smaller groups and then compares individuals within these

subsamples of the data. This runs many of the same risks as cross-sectional analyses, and the reliance on small subgroups produces larger standard errors.

Schleifer and Chaves (2014) used fixed- and hybrid-effect models that focus on within-individual change. Using these approaches, they found that only adding a school-aged child (6-12 years old) to a household was related to change in religious service attendance. The core benefit of fixed-effects models is that they allow for each individual in a survey to effectively act as a control for himself or herself for all time-invariant characteristics (Allison 2009). Furthermore, fixed- and hybrid-effects approaches are able to address potential biases introduced by comparing individuals to one another. By isolating individual change, fixed-effects models (and the within-individual component of a hybrid-effects model) cannot be the product of differences between individuals in their time-invariant underlying characteristics; rather, the effects captured show the change in individuals' religious service attendance that accompany changes in individuals' family structure (Schleifer and Chaves 2014).

While these longitudinal approaches are an improvement over cross-sectional models, they each have drawbacks. Random-effects models do not distinguish between-individual differences from within-individual differences. The lagged model does not use all of the information provided by longitudinal data. Fixed- and hybrid-effect models risk underestimating the effects of key variables of interest because they require a large amount of within-individual variation to capture significant effects. Moreover, these approaches are limited "under conditions commonly encountered in the social sciences" (Curran, Obeidat, and Losardo 2010: 3). In particular, these approaches all

assume that any change in attendance must be the product of the covariates within these models. Functionally, these approaches assume stability in the outcome of interest and explain any variation as a product of the model covariates. In certain contexts, these assumptions may be appropriate. However, there remains the possibility that growth or decline in religious service attendance is the product of some unobserved characteristic within the population or of changes that began before the data collection occurred. Trajectory models build change into their framework and then seek to capture individual variation after accounting for average growth, decline, or stability in the model outcome. LCMs – a class of trajectory model – account for individual change by allowing respondents to vary freely in their trajectories while the LCMs model the potential intra-individual change over time (Preacher, Wichman, MacCallum, and Briggs 2008).

The LCMs presented in this study allow individual religious service attendance trajectories to vary freely. LCMs can capture the effects of marriage, parenthood, and child age net of the individuals' average growth, decline, or stability in religious attendance. This addresses a concern of longitudinal modeling: that the effects captured in these models are the artifact of different trajectories rather than the product of the particular event we are interested in studying (Morgan and Winship 2007: Ch.9). LCMs capture random intercepts and random slopes that allow individuals within a sample to have different starting religious service attendance (intercepts) and different attendance trajectories (slopes). Having captured these constructs, LCMs then account for inter-individual differences in these slopes across the family formation covariates. With

LCMs, analysts can answer additional questions about the relationship between religious practice and family formation. For example: within the US population, what are the average initial levels of religious participation, and do we expect, on average, these levels to change as a function of time? Understanding these average trajectories, do we then expect any predictable variation among individuals around this population average? And finally, can we capture the effects of change in family structure on changes in religious service attendance while allowing individual cases to have different initial starting points and trajectories?

2.2 Methods

2.2.1 Data

This study uses two three-wave panels from the GSS panel data. The GSS is a nationally-representative, face-to-face survey of the non-institutionalized adult population of the United States. Each panel collected three waves of data in 2006, 2008, 2010 and in 2008, 2010, 2012, respectively. Of the 4,510 respondents surveyed in 2006, the GSS randomly selected 2,000 to re-interview in 2008 and 2010. The 2006 panel response rate was 77 percent (N = 1,536) in 2008 and 83 percent (N=1,276) in 2010. Overall, 64 percent of the respondents empaneled in 2006 were re-interviewed in 2010. For the 2008 panel, the GSS interviewed 2,023 new individuals. Of these 2,023 new interviews for the 2008 panel, the GSS panel response rate was 78 percent (N=1,581) in 2010 and 82 percent (N=1,295) in 2012. For the 2008 panel, 64 percent of individuals newly-empaneled in 2008 were re-interviewed in 2012. In a formal test of survey item reliability across the 2006 panel, Hout and Hastings (2012) found strong reliability across this panel for

religious beliefs and values. The GSS panels have been used to study religious variation and change (Lim, MacGregor, and Putnam 2010; Hout and Hastings 2014; Schleifer and Chaves 2014; Vaisey and Miles 2014).

2.2.1.1 Dependent Variable

The GSS asks respondents: ''How often do you attend religious services?" Responses are coded into categories: "'never' (0), 'less than once a year' (1), 'once a year' (2), 'several times a year' (3), 'once a month' (4), 'two or three times a month' (5), 'nearly every week' (6), 'once a week' (7), and 'more than once a week' (8)." The models presented here treat this variable as continuous. In additional models, I treat religious service attendance as a categorical variable and achieve substantively similar results. However, using attendance as a categorical variable complicates interpretation (Roos 2013), and treating attendance as a continuous variable has several desirable statistical properties including full information maximum likelihood approaches to treating missing data (Allison 2002; Allison 2003; Enders 2010). In these data, 60 percent of individuals changed their attendance between the first and second waves, with 36 percent of individuals increasing attendance and 24 percent decreasing attendance. Between the second and third waves, 49 percent of individuals changed their attendance, with 27 percent increasing attendance and 22 percent decreasing attendance. Overall, 23 percent of individuals were completely stable in terms of their religious service attendance, and 76 percent of individuals showed some sort of variability in attendance across the three panel waves.

2.2.1.2 Independent Variables

The GSS also collects information about individual family structure; these questions form my key independent variables. In the final set of models, these indicators are allowed to vary across panel waves. Marriage is an indicator of whether respondents are currently married. In these samples, 34 percent remained married, 45 percent remained unmarried, and 21 percent changed their marital status at least once across the survey waves. The GSS asked respondents the total number of children they have ever had. This variable runs from zero to eight or more, and I transform this into three binary indicators for (1) birth of the first child, (2) birth of the second child, and (3) birth of the third child, with the comparison group those with no children. In the models that include between-individual variation, the third variable represents people with three or more kids versus two or fewer. The mean number of children is two, with 26 percent of individuals reporting two children in at least one survey wave and 25 percent reporting no children in any wave.

The GSS also collects information about the age of children in the household. Respondents were asked the number of household members under 6 years of age (babies), 6 to 12 years of age (preteens), and 13 to 17 years of age (teens). I transform each of these variables into binary indicators for the presence (or absence) of children of that age group. Seventeen percent of individuals moved in or out of the "babies" category. This means that they either added a baby or ceased to have at least one child under the age of six in their household. For both the "preteen" and "teenager"

categories, about 16 percent of individuals moved in or out of these categories across survey waves.

2.2.1.3 Control Variables

I use several time-invariant measures to adjust for individual differences in religious service attendance for some of my LCMs. Unless otherwise mentioned, each of these variables come from time 1 for each panel (2006 and 2008, respectively). The GSS asks respondents about the highest educational degree they have completed. I use this to create four dummy indicators – high school, some college, bachelor's degree, and advanced degree – to capture educational differences in attendance, with less than high school as the comparison group. To control for parents' education, I include an indicator for whether either parent has completed at least a bachelor's degree. Race is captured by two binary indicators for (1) black and (2) other race, with white as the comparison group. To control for gender, I include a dichotomous indicator for female respondents, with male as the comparison group. Roos (2013) found that political leanings influence religious service attendance, so I control for political leanings by including two dummy variables that indicate (1) conservative or (2) liberal political leanings, with political moderates as the comparison group. (This is a recode of the GSS POLVIEWS variable.) I include a continuous measure of age to adjust for age variation in attendance. For the conditional time-invariant models, I include the family-formation indicators from wave 1 of these surveys to capture any differences across family indicators before I treat them as time-varying.

To adjust for denominational variation in religious service attendance, I use a modified version of the religious tradition scheme proposed by Steensland et al. (2000). The modification implemented here has two parts. First, following Wilcox and Wolfinger (2007) and Uecker and Ellison (2012), I decompose black Protestants into mainline Protestant and evangelical Protestant groups, based on a re-coding of their responses to the GSS denominational questions. The second modification uses the extra information provided by longitudinal data. These data allow analysts to track individual changes in religious affiliation across these panels. Religious switching is commonplace (Sherkat 1991; Sherkat and Wilson 1995; Loveland 2003) and may affect rates of religious service attendance. To control for this, I include an indicator for those individuals who switched religious tradition at least once, which includes about 53 percent of individuals across these panels. I include the small number of Jewish individuals in this sample (176) in the "other traditions" category. After these adjustments, there are five indicators of religious tradition: (1) mainline Protestants, (2) Catholics, (3) other religious traditions, (4) no religious affiliation, and (5) changing affiliation at least once, with a reference category of evangelicals.

2.2.2 Analytic Strategy

2.2.2.1 Unconditional and Conditional LCMs

LCMs can test whether or not change occurs, disaggregate individual from contextual effects, and examine whether individuals change over time (Singer and Willett 2003; Bollen and Curran 2006; Preacher, Wichman, MacCallum, and Briggs 2008;

Roos 2013). The most basic LCM is an unconditional LCM, represented by the following equations:

$$y_{it} = \alpha_i + \lambda_t\beta_i + \epsilon_{it}$$
$$\alpha_i = \mu_\alpha + \zeta_{\alpha i}$$
$$\beta_i = \mu_\beta + \zeta_{\beta i}$$

Where:

$i = 1, 2, \ldots, N,$ where N is the total # of cases

$t = 1, 2, \ldots, T,$ where T is the total # of time points

Combined Equations:

$$y_{it} = (\mu_\alpha + \lambda_t\mu_\beta) + (\zeta_{\alpha i} + \lambda_t\zeta_{\beta i} + \epsilon_{it})$$

Here, y_{it} represents the outcome variable that may change over time for each individual i across time t. In this case, y_{it} is the frequency of religious service attendance for each individual, which is allowed to vary across survey waves. Alpha (α_i) is the intercept or starting attendance that varies freely for each respondent – much like standard longitudinal models. Beta (β_i) is the slope trajectory that is allowed to vary for each individual, and λ_t is a constant that captures the value of the slope variable at time t. The inclusion of the $\lambda_t\beta_i$ component in the first equation represents the core difference between the LCMs and the more traditional longitudinal approaches discussed above. Epsilon (ϵ_{it}) represents the model error.

The level 2 equations model the individual intercepts (α_i) and individual slope (β_i) by capturing the population mean intercept (μ_α) and population mean slope (μ_β) while also accounting for individual variance around these means ($\zeta_{\alpha i}$ and $\zeta_{\beta i}$ respectively). These variance components are important for determining whether the LCM approach is an appropriate modeling strategy. While LCMs may uncover a population intercept or slope that is not statistically different from zero, if there is a

meaningful amount of variation around these population means (i.e., if the $\zeta_{\alpha i}$ or $\zeta_{\beta i}$ show significant effects), this represents strong evidence for including both an intercept and a slope term in the model. If the $\zeta_{\beta i}$ does not produce a statistically significant effect, this provides evidence for preferring some of the more traditional approaches to longitudinal analyses. (Appendix A includes the structural equation model (SEM) path diagram for this and the additional LCMs presented in this chapter.)

If the LCM shows variation around the population mean intercept and mean trajectory, I can decompose this variance by including additional covariates. To start, I fit a conditional LCM with time-invariant covariates (Bollen and Curran 2006). Here I allow all of these covariates to affect the intercept and slope in the level 2 equations as follows:

$$y_{it} = \alpha_i + \lambda_t \beta_i + \epsilon_{it}$$
$$\alpha_i = \mu_\alpha + \boldsymbol{\gamma}_\alpha \mathbf{X}_i + \zeta_{\alpha i}$$
$$\beta_i = \mu_\beta + \boldsymbol{\gamma}_\beta \mathbf{X}_i + \zeta_{\beta i}$$

Combined Equations:

$$y_{it} = (\mu_\alpha + \lambda_t \mu_\beta) + (\boldsymbol{\Upsilon}_\alpha + \lambda_t \boldsymbol{\Upsilon}_\beta)\mathbf{X}_i + (\zeta_{\alpha i} + \lambda_t \zeta_{\beta i} + \epsilon_{it})$$

The difference between the unconditional model and this conditional model is that the level 2 equations now include a vector of covariates, $\mathbf{X}_i$, that vary freely for each individual. The coefficients, $\boldsymbol{\gamma}_\alpha$ and $\boldsymbol{\gamma}_\beta$, capture the effects of each covariate ($\mathbf{X}_i$) on the intercept (α_i) and trajectory (β_i), respectively. For example, if the marriage covariate in the α_i equation produces a positive and significant coefficient, this means that individuals who were married during the first panel wave, on average, have a higher starting attendance when compared to individuals who were not married at time 1. If the variable for having a first child in the β_i equation produces a meaningful positive

coefficient, this means that individuals who have a single child at wave 1 show a greater rate of change in religious service attendance than those who have no children at wave 1.

The conditional model with time-invariant covariates functions like cross-sectional models in that the covariates capture between-individual difference at time 1 while including an additional component ($\lambda_t\beta_i$) that accounts for change across waves. This approach addresses the question: Is there any predictable variation among individuals around the average starting religious service attendance or predictable differences in rate of change in attendance around the average trajectory? The main concern of this research, however, is whether there are any effects of change in family structure on changes in religious service attendance beyond any increase, decrease, or stability in attendance an individual shows before accounting for these family formation processes.

To address this question, I run two more conditional LCMs with time-invariant and time-varying covariates (Bollen and Curran 2006). These approaches are represented by the following two sets of equations:

Standard Approach

$$y_{it} = \alpha_i + \lambda_t\beta_i + \boldsymbol{\gamma_t\omega_{it}} + \epsilon_{it}$$
$$\alpha_i = \mu_\alpha + \boldsymbol{\gamma_\alpha X_i} + \zeta_{\alpha i}$$
$$\beta_i = \mu_\beta + \boldsymbol{\gamma_\beta X_i} + \zeta_{\beta i}$$

Where:

$$\mathrm{COV}(\boldsymbol{\omega_{it}}, \alpha_i) = 0$$

Within-Individual Approach

$$y_{it} = \alpha_i + \lambda_t\beta_i + \boldsymbol{\gamma_t\Delta\omega_{it}} + \epsilon_{it}$$
$$\beta_i = \mu_\beta + \boldsymbol{\gamma_\beta X_i} + \zeta_{\beta i}$$

Where:

$$\mathrm{COV}(\boldsymbol{\Delta\omega_{it}}, \alpha_i) \neq 0$$

The standard approach includes a vector of repeated measures $\boldsymbol{\omega_{it}}$ in the level 1 equation. This vector allows individuals to vary across the panel waves for the time-varying covariates (here, all of the family formation measures). Gamma ($\boldsymbol{\gamma_t}$) is a vector of coefficients capturing the effect of the individual change in these covariates on change in slope. The standard version functions like a random-effects model with the addition of a construct ($\lambda_t\beta_i$) that allows individuals' trajectory to vary freely. This approach also accounts for other individual differences by including time-invariant controls.

I fit a final conditional LCM with time-invariant and time-varying covariates, and impose the additional constraint of forcing the vector $\boldsymbol{\omega_{it}}$ to ignore between-individual differences and focus on within-individual change. This is represented by the inclusion of $\boldsymbol{\Delta}$ in the within-individual equations. This within-individual LCM only models within-individual variance in the time-varying component ($\boldsymbol{\Delta\omega_{it}}$) in the level 1 equation. Because $\boldsymbol{\Delta}\omega_{it}$ and α_i are allowed to covary freely in this within-individual LCM (i.e. $\mathrm{COV}(\omega_{it}, \alpha_i) \neq 0$), this model functions much like a fixed-effects model with the addition of the construct ($\lambda_t\beta_i$) that allows individuals to have different attendance trajectories before accounting for the changing family formation covariates. Because this within-individual approach focuses on individual variation around individual means for each family formation covariate, it allows respondents to effectively act as controls for themselves. Therefore, it is no longer necessary to include the α_i equation at level 2 since this model specification formally partials out all time-invariant characteristics that affect differences in starting attendance. The β_i equation captures the effects of individual change and therefore remains an important piece of this model. For the

standard model, a positive marriage coefficient ($\boldsymbol{\gamma_t\omega(marriage)_{it}}$) means that those who were married or got married at any time point across the waves show a higher rate of religious service attendance than those not married, beyond the expected change in the population. For the within-individual LCM model, a positive marriage coefficient ($\boldsymbol{\gamma_t\Delta\omega(marriage)_{it}}$) means that there is an increase in the rates of religious service attendance for those who got married between panel waves relative to those who did not change their marital status. Again, this is net of any change in rates of attendance predicted by the model before accounting for these changes in family structure.

2.2.3 Analyses

These LCMs conform to the basic two-factor model structure for an LCM with three time points. They represent a particular type of the general SEM (Bollen 1989; Bollen and Curran 2006) that includes latent variables that capture the individual starting points (intercept) and rates of change (slope). These models were estimated in Mplus 7 (Muthen and Muthen 2013), using the full information maximum likelihood (FIML) estimator to adjust for missing data. FIML adjusts for missing data by computing the likelihood function for each case using only the non-missing information in the construction of the covariance matrix. This approach to missing data has several desirable properties, including consistency, asymptotic unbiasedness, asymptotic normality, and asymptotic efficiency, all of which allow for chi-square (χ^2) tests of overall model fit (Bollen 1989; Arbuckle 1996; Allison 2003; Bollen and Curran 2006; Enders 2010). One of the key features of SEM analyses is that there are several fit statistics to assess whether these LCMs fit the data. Unless otherwise noted, all models

presented here displayed good fit across X^2, RMSEA, CFI, TLI, and Schwartz-Modified BIC. LCMs can be fit using hierarchal linear models as well as SEM approaches; both of these methods largely map onto one another. The SEM framework is preferable because of its flexibility in including both latent variables and multiple indicators as well as providing several additional approaches to assessing model fit (Bollen and Curran 2006). Furthermore, SEM is a robust approach for implementing FIML to address missing data.

2.3 Results

2.3.1 Unconditional LCM

Table 1 presents the unconditional LCM of religious service attendance from the GSS panels. This parallels the LCM model of religious service attendance used by Roos (2013). This unconditional LCM provides information on population averages of starting religious service attendance (intercept) as well as population trajectories (slope) of attendance. The population coefficient of 3.601 means that the average American attends religious services between several times a year (3) and once a month (4). Furthermore, the slope coefficient is not significant, which means that, on average, Americans' rates of religious service attendance are stable. The variance around the intercept (6.342, $p <$ .001) and slope (0.100, $p < .001$) shows that there is significant variation among Americans in both their starting attendance as well as their rates of change in attendance. The fact that both variance components are significant indicates that LCMs are appropriate when modeling religious service attendance.

Because I am using two distinct panels in this analysis, I perform a test to detect any differences across these panels. To capture this, I fit a multiple group analysis of the

unconditional LCM using the two panels as the grouping variable. The difference between the full LCM and the multiple group LCM is that the multiple group

Table 1: Selected Results from an Unconditional LCM of Religious Service Attendance

	Full Model[a]	Multiple Group Analyses by Panel[b]	
		2006 Panel	2008 Panel
Parameter Estimates	Coefficients[c]	Coefficients[c]	Coefficients[c]
Population Intercept (α)	3.60***	3.61***	3.595***
	(.21)	(.31)	(.06)
Population Slope (β)	-0.00	0.02	-0.03†
	(.01)	(.01)	(.01)
Variance Components			
Intercept ($\zeta_{\alpha i}$)	6.61***	6.34***	6.87***
	(.21)	(.31)	(.30)
Slope($\zeta_{\beta i}$)	0.13***	0.10***	0.16***
	(.02)	(.03)	(.03)
Slope with Intercept ($\sigma_{\alpha\beta}$)	-0.21***	-0.15***	-0.27***
	(.05)	(.07)	(.07)
$\text{Attendance}_{t1}(\sigma^2_{\epsilon 1})$	1.26***	1.64***	0.87***
	(.16)	(.24)	(.21)
$\text{Attendance}_{t2}(\sigma^2_{\epsilon 2})$	1.71***	1.81***	1.61***
	(.08)	(.13)	(.11)
$\text{Attendance}_{t3}(\sigma^2_{\epsilon 3})$	1.06***	1.15***	0.97***
	(.16)	(.24)	(.22)

Standard Errors in parentheses; N=4,016; † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
[a]Model Fit: $\chi^2(1)$ 4.36, p < .05; RMSEA .03; CFI = .999; TLI =0.998; BIC = -3.94
[b]Model Fit: $\chi^2(2)$ 4.36, p < .10; RMSEA .03; CFI = .999; TLI =0.998; BIC = -11.431
[c]Unstandardized Coefficients

LCM allows the intercept, slope, and variance components to vary freely between the two different panels. The results from the multiple group analysis are presented side by side in Table 1 in the 2006 and 2008 columns respectively. These results show that the population intercepts are virtually the same within each panel (3.610 in 2006 and 3.595 in

2008). However, we do see a slight difference in population average trajectories. The average American in the 2006 sample was stable in his or her religious service attendance. In 2008, there is a hint that the average American in this panel decreased his or her religious service attendance over these years (coef: -0.03; p= 0.051). Despite this slight difference, in additional models I fit a multiple group unconditional LCM that constrains the intercept and slope coefficients for 2006 and 2008 panels to be equal, similar to the full model. The Schwartz-Modified Bayesian Information Criterion (BIC = $\chi^2 - (\mathrm{df})\ln(\mathrm{N})$) provides a sensitive test of model fit, and a comparison between the constrained multiple group LCM (BIC = -21.521) and the unconstrained version (BIC = -11.431) provides evidence that justifies preferring the constrained model. While we cannot test the multiple group LCM against the full LCM because they have different covariance matrices (i.e., the full model does not take the different panels into account), this test suggests that this approach provides a better fit to the data relative to the multiple group unconditional LCM.

2.3.2 Conditional LCM with Time-Invariant Covariates

The unconditional LCM shows meaningful variation across this population in the starting point of religious service attendance as well as in the rate of change in attendance. Table 2 presents a conditional LCM with time-invariant covariates on religious service attendance. This model includes several covariates from the first waves of these panels to capture some of the variance in the population mean intercept and population average trajectory. Decomposing the LCM by including these additional covariates accounts for some of the heterogeneity in both the population's starting

attendance level and in the rates of change in attendance. While the intercept and slope coefficients are presented side by side, they represent a single LCM model.

Table 2 shows meaningful variation in starting attendance (intercept) across these time-invariant covariates. Relative to evangelicals, people within all of the other religious traditions show lower levels of starting attendance, with the lowest starting attendance among those with no religious affiliation during wave 1 of these panels. The education coefficients show an increase in starting religious service attendance with each step higher on the educational ladder. Relative to political moderates, those with more liberal political leanings report a lower starting attendance, while those who are more politically conservative report a higher starting attendance. Overall, women have a greater starting religious service attendance compared to men, and blacks and those of other races show greater starting attendance relative to whites.

Among time-invariant family formation variables, this model shows many of the effects we expect from cross-sectional analyses. Those who are married at wave 1 have a greater starting religious service attendance compared to those who are not married, and those in families with more children have higher starting attendance levels. Though the coefficient does not reach statistical significance, there is a hint that those with at least one preteen child in the household at wave 1 have a slightly higher starting attendance level. Across these family formation measures, there is one statistically-significant change in the rate of religious service attendance: Those who had two children at wave 1 show a decreasing rate of attendance over time.

Table 2: Conditional LCM with Time-Invariant Covariates of Religious Service Attendance

	Full Model[a]	
	Intercept	Slope
Parameter Estimates	Coefficients[b]	Coefficients[b]
Family Formation		
Marriage	0.48***	0.03
	(.09)	(.02)
Total # of Children[c]		
One Child	-0.03	-0.03
	(.13)	(.03)
Two Children	0.22	-0.08**
	(.13)	(.03)
Three or more Children	0.35**	-0.02
	(.13)	(.03)
Age of Children in Home		
Babies (0-5 Years Old)	-0.01	0.03
	(.13)	(.03)
Preteens (6-12 Years Old)	0.22	-0.05
	(.12)	(.03)
Teens (13-17 Years Old)	0.06	-0.03
	(.10)	(.03)
Religious Affiliation[d]		
Mainline protestants	-0.63***	0.03
	(.18)	(.04)
Catholic	-0.57***	0.02
	(.15)	(.03)
Other Religious Tradition	-0.52*	0.08
	(.25)	(.05)
No Affiliation	-3.71***	0.08*
	(.19)	(.04)
Religious Switchers	-1.42***	0.07**
	(.11)	(.03)
Education[e]		
High School Degree	0.13	-0.02
	(.12)	(.03)
Some College Degree	0.32	-0.08
	(.17)	(.04)
Bachelor Degree	0.54***	-0.02
	(.15)	(.04)

Table 2 (Cont)

	Full Model[a]	
	Intercept	Slope
Parameter Estimates	Coefficients[b]	Coefficients[b]
Education (cont.)		
Advanced Degree	0.62***	0.00
	(.18)	(.04)
Parents Minimum Degree		
Bachelor Degree	0.14	-0.00
Political Views[g]	(.11)	(.03)
Liberal	-0.26**	-0.04
	(.10)	(.03)
Conservative	0.75***	-0.04
	(.09)	(.02)
Demographics		
Female	0.54***	0.03
	(.08)	(.02)
Race[h]		
Black	1.06***	0.06*
	(.12)	(.03)
Other Race	0.33**	0.03
	(.13)	(.04)
Age	0.02***	0.00
	(.00)	(.00)
2008 Panel	0.10	-0.05
	(.09)	(.02)

Standard Errors in parentheses; N=4,023;

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a]Model Fit: $\chi^2(24)$ 31.56, p < .16; RMSEA .01; CFI = .999; TLI =0.997; BIC = -167.63

[b]Unstandardized Coefficients

[c]No children, [d]evangelicals, [e]Less than high school, [f]political moderates, and [g]whites are the comparison groups.

This conditional LCM shows that individuals who report no religious affiliation and those who switch their religious affiliation at least once both show an increase in their rates of religious service attendance across these panels. Among the unaffiliated, this may indicate a kind of regression to the mean among the least religious people.

Alternatively, this correlation may indicate the increase of the religious individuals who chose not to affiliate with denominations (Lim, MacGregor, and Putnam 2010). The increasing attendance among religious switchers may be a manifestation of the religious fervor often experienced by the newly-converted. While there are differences between the 2006 and 2008 panels across these covariates, additional tests show that these differences are largely the result of reduced statistical power when the panels are analyzed separately rather than any substantive differences in coefficients.

2.3.3 Conditional LCM with Time-Varying and Time-Invariant Covariates

To determine whether change in family structure leads to change in religious service attendance beyond average changes in the population, I fit additional conditional LCMs with time-varying and time-invariant covariates (Bollen and Curran 2006). These models allow the family formation measures to vary across the survey waves, making them time-varying covariates. The standard model captures both between- and within-individual differences within these time-varying covariates, while the within-individual model focuses on individual change to capture these theoretically interesting effects. While coefficients are not shown here, each of these LCMs controls for the non-family time-invariant covariates and, while the within-individual models do not include the intercept components, these models show the same substantive effects shown in Table 2.

The standard model in Table 3 confirms the prevailing story. These results show a positive effect of marriage on the trajectory of religious service attendance across these panels. The 0.34 coefficient means that the slope for religious service attendance for married individuals as well as individuals who get married across these panels shows

an increasing rate of attendance above the average trajectories captured in the model. Moreover, recall that these effects control for several time-invariant covariates that have been shown to affect rates of religious service attendance. This growth rate means that married individuals and those who get married during these panels, on average, attend at almost an entire category higher at wave 3 relative to their attendance a wave 1. For example, if they report attending once a month in wave 1, they would report attending nearly every week by wave 3.

While those who are or become parents do not significantly change their attendance in this standard model, those who have two children or add a second child show an increasing rate of religious service attendance relative to those with no children. This effect increases for those with three or more children or who add a third child, again beyond any anticipated growth within this population. In terms of household age structure, we see that those households with or adding a preteen also show an increase in their rates of religious service attendance.

The standard model confirms the general view that all of these family-formation processes increase religious service attendance, even after accounting for the random growth expected within the population. However, the standard approach constrains both between- and within-individual variation for the time-varying covariates in this model to be the same. While this may be a reasonable constraint, it is not necessarily the best approach for testing causal claims (Schleifer and Chaves 2014). The within-individual model differs from the standard model by focusing only on within-individual variation in these time-varying effects. When focusing on individual change over time,

the within-individual model suggests that getting married does *not* affect individual rates of religious service attendance. The fact that the marriage effect does not appear in the within-individual model and is present in the standard approach model suggests that between-individual variation is driving the marriage effect in the standard model. These between-individual differences rely on information similar to that captured in cross-sectional analyses, which compare those who are married to those who are not. When focusing on whether individuals themselves are changing in the within-individual LCM, this marriage effect disappears. In other words, getting married does not produce an increase in individual rates of religious service attendance.

Some of the within-individual time-varying covariates do indicate some meaningful differences in religious service attendance across the measures of changing family structure. The indicators for becoming a parent, adding a second child, and adding additional children all show strong and meaningful effects on rates of religious service attendance in the within-individual model. Moreover, adding a preteen child to the household also directly increases rates of religious service attendance. The parenthood and the preteen coefficients are the only effects that increase rates of attendance in both the standard and within-individual models, even while controlling for average changes in the population.

Schleifer and Chaves (2014) found that, when focusing on individual change over time, getting married, becoming a parent, and having additional children did not affect religious service attendance. The present study, using a more sophisticated model and additional data, confirms that marriage does not affect attendance. However, these new

Table 3: Conditional LCMs with Time-Varying and Time-Invariant Covariates of Religious Service Attendance

	Standard[a,b]		Within-Individual Models[a]							
			Full Model[c]		Multiple Group Analyses by Panel					
					2006 Panel[d]		2008 Panel[d]		Constrained[e,f]	
Marriage	0.34***	(.06)	0.12	(.09)	0.10	(.12)	0.10	(.13)	0.10	(.09)
Total # of Children[h]										
One Child	0.09	(.09)	0.26*	(.13)	0.30	(.19)	0.13	(.18)	0.21	(.13)
Two Children	0.21*	(.10)	0.38*	(.16)	0.34	(.24)	0.33	(.22)	0.33*	(.16)
Three or more Children	0.39***	(.10)	0.47**	(.18)	0.26	(.27)	0.57*	(.25)	0.42*	(.18)
Age of Children in Home										
Baby (0-5 Yrs Old)	-0.02	(.09)	-0.04	(.08)	0.02	(.11)	-0.10	(.11)	-0.04	(.08)
Preteen (6-12 Yrs Old)	0.22***	(.06)	0.22***	(.07)	0.27**	(.10)	0.17	(.10)	0.22***	(.07)
Teen (12-17 Yrs Old)	-0.01	(.06)	-0.01	(.07)	0.03	(.10)	-0.08	(.10)	-0.03	(.07)

Standard Errors in parentheses; N=4,023; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a]Each model controls for the time invariant effects of religious affiliation, education, parents education, politic views, and demographics. Coefficients excluded to conserve space

[b]Model fit: $\chi^2(74)$ 103.54, p < .01; RMSEA .01; CFI = 0.996; TLI =0.993; BIC = -510.65

[c]Model fit: $\chi^2(53)$ 50.74, p < .56; RMSEA .00; CFI = 1.000; TLI =1.002; BIC = -389.145

[d]Model fit: $\chi^2(104)$ 98.67, p < .63; RMSEA .00; CFI = 1.000; TLI =1.002; BIC = -764.511

[e]Model fit: $\chi^2(111)$ 103.45, p < .68; RMSEA .00; CFI = 1.000; TLI =1.002; BIC = -817.824

[f] The constrained model forces the family formation effects to be equal across panels.

[g]Unstandardized Coefficients.

[h]Those with 'no children' are the comparison group.

analyses show that having a child and having additional children does increase religious service attendance beyond the average growth or stability observed within the population. Schleifer and Chaves' (2014) analyses used only the 2006 GSS panel. In this chapter, I include multiple group analyses of the within-individual models to highlight the differences between these two separate panels within this modeling framework. The 2006 and 2008 columns of Table 4 show the differences between panels in terms of the within-individual family formation effects. In 2006, only the addition of a preteen child to the household shows a meaningful effect on attendance, confirming what Schleifer and Chaves found. In 2008, the parenthood effects are weaker than in the full model and the preteen effect is only marginally significant ($p \geq 0.10$). The constrained model in this table runs a multiple group analysis on this LCM that constrains the family formation effects to be equal across panels. This shows that the direction and size of the coefficients stay relatively stable across all of these within-individual multiple group LCMs. The core difference is that in the constrained model there is a decrease in the standard errors for all the meaningful family formation effects. This suggests that the different effects across the 2006 and 2008 panels are the product of a reduction in statistical power rather than the overall absence of these effects.

Across all the time-varying family formation models, the effect that is most consistently observed is the addition of the preteen child to the household. While the full within-individual model shows a meaningful effect for having a first child, having a second child, and having additional children, these effects do not appear in the models that focus on the 2006 and 2008 panels in isolation. Analysis of model fit suggests that

combining these panels is appropriate, and the lack of effect in the isolated panels may indicate that there is not enough statistical power within a single three-wave panel to fully capture the effects of parenthood on religious service attendance.

2.4 Conclusion

This study has explored the relationship between family formation and religious service attendance. The findings suggest that marriage, parenthood, and child age are all related to religious service attendance, as previous research has shown. However, the relationship between marriage and religious service attendance is entirely a matter of between-individual comparisons. In other words, married people, on average, attend religious services more than people who are not married. *Getting* married, however, does not increase religious service attendance when we focus on individual change over time. Only becoming a parent, having additional children, and having a child reach school age appear to directly increase parents' religious service attendance in the within-individual models. The fact that the marriage effect relies on between-individual comparisons has strong implications for those studying religion and the family. These results suggest that the strong correlation between marriage and attendance indicates unobserved variable bias, reverse causation, and/or indirect causation that takes effect only when the married couple has children and those children reach school age.

These results raise interesting questions for future research. Has the marriage correlation always represented difference between people, or has the causal connection between marriage and attendance declined over time? Because of the relatively short time span covered by these data, these results are mainly focused on the younger

cohorts most likely to have married between 2006 and 2012. Individuals in the United States, however, are getting married later in life, and more are remaining unmarried. When individuals get married later in life, is it reasonable to assume that they have established firmer habits and practices within their religious (or areligious) lives? Wuthnow (2007) has argued that the decline in religious participation over the last twenty years is largely the product of changes in marriage timing and increases in cohabitation. It is hard to address the historical implications concerning marriage's effect on religious behavior since large-scale longitudinal data that capture information about individuals' religious lives has only recently become widely available. A next step should be to further explore these relationships in additional waves of the GSS panels, the Adolescent Health panel data, the National Study of Youth and Religion panel data, the National Longitudinal Survey of Youth (particularly the 1997 panel), as well as other longitudinal resources that collect information about religious change to explore these effects for other cohorts.

This study also demonstrates the value of LCMs for the study of family and religious processes. This is a powerful and flexible approach to modeling individual change and stability over time. The results here present strong evidence for the need to account for individual change in models of religious service attendance. While the analytical approach provided by LCMs may not be appropriate in all circumstances, the above analyses validate this approach when studying the dynamic effects of family structure on religious service attendance.

In this study, I have focused on the well-documented relationship between family formation and religious service attendance. My findings suggest that supplementing cross-sectional analysis with models that capture within-individual change reveal significant new information concerning religious practice and changing family structure. These results warrant rethinking and modifying widely-accepted assumptions about the relationship between family formation and religious service attendance. In particular, if the methods we implement rely on comparing individuals, we should be careful about attributing causal relationships to our results. In this case, getting married does not appear to directly cause an increase in religious service attendance. It is kids, especially school-age kids, that increases people's religious service attendance.

3. College Degree Completion and Changing Religiosity: Modeling Individual Change over Time

The relationship between religion and education, particularly higher education, is a long-standing concern among sociologists of religion. In part, this concern grows out of the work of classical theorists such as Durkheim ([1912]1995: 431) and Weber (1946) who theorized that, as education becomes more important in the modern world, traditional religion would become less influential. This prediction became one of the pillars of secularization theory, and several scholars canonized the notion that more widespread educational attainment is one of the most important pathways leading societies to become more secular (Berger 1967a; Berger 1967b; Luckmann 1967; Martin 1978; Dobbelaere 1981; Tschannen 1991; Bruce 2002). However, contemporary empirical work in this area has produced mixed results. While some scholars have shown that education promotes non-affiliation (Hout and Fischer 2002; Baker and Smith 2009; Kosmin and Keysar 2009), others claim that this negative relationship has been decreasing over time (Schwadel 2014). Education may shake conservative religious belief (Johnson 1997; Hill 2011), but this relationship seems mediated by religious tradition (McFarland, Wright, and Weakliem 2011), and in some cases does not appear at all among the most recent cohorts (Trinitapoli 2007; Schwadel 2011). Moreover, some find that religious *practice* does not seem to be affected by additional education, while others find that education may lead to *increases* in religious practice (Arnett and Jensen 2002; Lee 2002; Schwadel 2011). This pattern of mixed results led Mayrl and Oeur (2009:

260) to claim that, while "the voluminous literature on religion and higher education has been normative or theoretical in character, [it is] filled with grand claims noticeably lacking in empirical justification."

While much has been learned from this research, these studies have relied on cross-sectional data. Analyzing cross-sectional data depends on comparing individuals who have a college degree to those who do not, and this data structure is unable to watch individuals as they change over time. With the increasing availability of longitudinal data, analysts now have additional information about respondents' religious lives and are now able to track individuals as they change (or do not change) their religiosity. Analysts can now use longitudinal modeling techniques to observe within-individual change over time, which allows us to assess whether *completing a junior college degree*, *finishing a bachelor's degree*, or *adding an advanced degree* leads to changes in an individual's religiosity. Instead of relying on comparing individuals – a constraint of cross-sectional data – we can now assess whether an individual's change in educational attainment is accompanied by a change in that individual's religiosity.

Using General Social Survey (GSS) panel data, I investigate the relationship between religion and education to see if this relationship relies on between-individual differences or if it also involves actual individual change. By estimating random-, fixed-, and mixed-effects models (Allison 2005; Allison 2009; Bollen and Brand 2010), I isolate individual change over time and am better able to assess causal interpretations of the

relationship between educational attainment and religiosity (Manski 2013; Angrist and Pischke 2014; Morgan and Winship 2015). The results show that the relationship between educational attainment and change in religiosity is present in the models that focus on comparing those with a college degree to those without a degree. However, when modeling change directly, I find little or no association between completing a college degree and change in religious belief or religious practice. However, my analyses were able to uncover a provocative gender difference in the effect of education on religiosity that is largely lost in cross-sectional analysis. While completing an educational degree does not appear to decrease men's conservative religious beliefs, completing a degree does decrease women's conservative religious beliefs. I conclude by discussing my results' implications for the study of education and religion.

3.1 Background and Motivation

The relationship between religion and higher education has an interesting history. The first higher education institutions were, for the most part, centers for monastic or priesthood training (Pedersen 1997). However, as higher education spread across the modern world, these educational institutions began to differentiate themselves from their historical religious roots (Smith 2003). Social theorists who noticed this decoupling began to claim that education – along with the rise of a scientific worldview that was assumed to accompany higher education (Reiss 1970; Tschannen 1991; Evans and Evans 2008; Evans 2011) – would force the "gradual recession of

religious claims to interpret both the natural universe and the social order" (Wilson 1982: 54). This sort of grand claim has provided the impetus for the vast amount of research on the relationship between higher education and religiosity.

Contemporary empirical research in this area, however, has produced mixed findings. Here I will focus on the effects of education on religious belief and religious practice. In terms of religious belief, some have shown that there may be direct negative effects of education on religious beliefs (Hoge, Benton, and Luidens 1993; Johnson 1997). However, others highlight the wide amount of variation in the strength and direction of these effects across different social and religious groups. McFarland et al. (2011), for example, found that mainline Protestants and the religiously unaffiliated showed large declines in an inerrant view of Bible as they became more educated, but conservative Protestants and Catholics showed the opposite effect, with greater levels of conservative religious beliefs as they became more educated. Hammond and Hunter (1984) found that students on strict evangelical campuses retained their evangelical worldviews to a greater degree than students on loose evangelical campuses. Campus life also seems to have a particularly positive effect on religious belief among Mormons (Albrecht and Heaton 1984).

It may also be that education affects certain types of religious beliefs. Some research shows that a college education may decrease exclusivist religious beliefs – believing, for example, that there is only one path to God or that the Bible is the inerrant

word of God – but not pluralistic religious beliefs – believing, for example, that there are multiple pathways to God (Trinitapoli 2007; Schwadel 2011). Stark (1963) highlighted the difference between advanced graduate education and undergraduate education in terms of the effects on religious beliefs, and Wuthnow (1985) noted that those in the natural sciences have more resilient religious beliefs when compared to those in the social sciences. This suggests that the type of education one receives may play an important role in shaping his or her religiosity.

Others contend that the effects of education on religious beliefs are weak or non-existent. Hill (2014) claimed that there are limited if any effects of education on belief in evolution and that the type of college matters, with attendance at evangelical, mainline, and Catholic schools having little or no effect of education on this belief. Mayrl and Uecker (2011) found no significant effects of education on the liberalization of religious beliefs, though they did see an increase in the questioning of beliefs even if the content of the beliefs remained the same. It may be that religious beliefs themselves remain stable while the doubt, questioning, or surety concerning these beliefs change as individuals become more educated (Johnson 1997). Using a panel of college students, Stoppa and Lefkowitx (2010) found no change in beliefs across the first three years of college, and Farrel (2011) showed no liberalizing effects of college on evangelicals' stances on social issues. These mixed finding have led some to argue that education

affects religious belief only when those beliefs are loosely held to begin with (Ganzach, Ellis, and Gotlibovski 2013).

The effect of education on religion may have changed over time. Hasting and Hoge (1981) argued that the effects of education on religiosity may have been exacerbated by the large number of first-generation college students among the baby boomers, but subsequent cohorts have not experienced the same negative effect of education on religion as higher education became more and more a normal part of social life in America. What effect education has had on religious beliefs appears to be declining (Wuthnow 2007), and Schwadel (2014) noted that the strong negative cross-sectional relationship between education and religious belief has been decreasing across recent cohorts in the US.

Research on the effects of education on religious practice also produces mixed results. Schwadel (2011) found that education actually increases religious participation, and Uecker, Regnerus, and Vaaler (2007) found that, while there has been a general decline in religious participation among Americans, those with a college education show a slower rate of decline relative to the non-college educated. One of the issues for studies in this area is untangling the additional decreases in religious practice that accompany young adults as they leave their childhood home. While 66 percent of college students attended at a lower rate than they did before college, this may not be the effect of education per se, but rather a reflection of the cultural organization of college life

(Uecker, Regnerus, and Vaaler 2007). Saenz and Barrera (2007), using a partial panel design**,** found that college juniors discussed religion less frequently and attended religious services less often than they did as freshmen, but they were unable to compare these college students to young adults not attending college. Bryant, Yun Choi, and Yasuno (2003), also found that sophomores prayed (or meditated) less often than they did as freshmen, though there was a general increase in the commitment to integrate spirituality into their daily lives across their four-year panel of college students. Hill (2011) found that religious service attendance bounced back to pre-college levels upon graduation. While there may be a pattern of decrease in religious practice among college students, this pattern also appears among young adults who do not attend college. Some have even argued that college provides a buffer against general declines in religious participation among young adults (Uecker, Regnerus, and Vaaler 2007).

3.1.1 Moving Beyond Cross-Sectional Comparisons

Much of the above research on education's influence on religiosity has relied on cross-sectional data. Analyzing this type of data depends on comparing individuals who have a bachelor's degree to those who do not, or those who have finished a graduate degree to those who have not. With this type of data, analysts cannot directly assess whether an individual completing an educational degree changes his or her religious beliefs or practices. One potential risk of this type of data analysis is reverse causation or the possibility that individual religiosity shapes the propensity to pursue higher

education. Indeed, there is a parallel body of literature that focuses on causation in the other direction. Studies in this area show that individuals belonging to conservative religious traditions are less likely to pursue higher education (Lehrer and Chiswick 1993; Darnell and Sherkat 1997; Lehrer 1999; Lehrer 2004; Glass and Jacobs 2005; Keister 2008).

The increasing availability of longitudinal data allows analysts to revisit the relationship between education and religiosity with an additional set of statistical tools. Longitudinal analyses are not new to sociology, but only recently have that large-scale longitudinal data that collect information on individuals' religious lives become widely available. Scholars of higher education have often used panels of college students to explore change over time for the traditional four-year tenure in college (for example, Bryant, Yun Choi, and Yasuno 2003; Bryant and Astin 2008). A problem with this approach is that these studies are unable to compare these panels of college students to individuals who are not attending college. This may lead to confusion over whether analysts are capturing the effects of education or the confounding effects of college culture and the effects of age (i.e., young adulthood) on religious belief, practice, and belonging.

Some sociologists have begun to use nationally-representative panel data that trace both those who attend and do not attend college to explore these relationships. Hill (2011) used the first two waves of the National Study of Youth and Religion to estimate a change model that captures a modest increase in skepticism toward super-

empirical religious beliefs, though this effect varies across different college types. Uecker et al. (2007) used the Adolescent Health Panel Data and a lagged variable model, and they find that education decreases religiosity. This type of lagged model uses respondents' information from time 1 to put individuals into groups of theoretical interest, and then these models are estimated using information from time 2. This allowed them to focus on specific groups to see if people in these groups changed their religiosity upon completing a higher educational degree. This approach is appealing because it emphasizes particular groups (for example, those who complete a college degree or those who are at a certain age), and by limiting attention to people with particular characteristics at time 1, it may account for some time dependency in religious belief and practice. However, this approach relies on an analyst's theoretical sorting of the data and does not model individual change directly. Instead, this approach cuts the data into smaller groups and then compares individuals within these subsamples. This runs many of the same risks as cross-sectional analyses and, more significantly, the reliance on small subgroups produces larger standard errors.

The present study builds upon this research by exploring the relationship between educational attainment and religiosity using an additional set of longitudinal models. By implementing a series of random-, fixed-, and mixed-effects models, this study disaggregates between-individual differences and within-individual changes. This allows me to investigate the extent to which the relationship between educational

attainment and religiosity is driven by individuals as they change over time, and the extent to which it reflects differences between the highly educated and the less educated. By modeling aggregate indices of conservative religious belief and religious practice, the models presented here are able to capture changes in religiosity that accompany individual changes in educational attainment.

Moreover, by moving away from cross-sectional analyses I may be able to detect sub-group differences in the effects of college on religiosity. While the current literature on the effect of education on religion has not focused on gender differences, there is a large literature that focuses on how higher education can affect men and women in different ways (Pascarella and Terenzini 2005). My analyses pursue the possibility that there is a gender difference in the effects of education on religious belief and practice that is not evident in cross-sectional analyses. In other words, I will investigate whether completing a college degree affects men's and women's religious belief and practice differently.

3.2 Methods

3.2.1 Data

This study uses the same two 3-wave panels from the GSS that I used in the previous chapter. For the analyses presented here, though, I use two different versions of this GSS panel data. The first is the full, combined GSS panels. This dataset allows me to capture any effect of change in education on change in religiosity. Literature on the

effects of education on religiosity has a long history within sociology and largely has predicted that education will lead to *declines* in religious belief and practice. However, if people arrive at college already highly secularized, college cannot further reduce their religiosity, and including such people in the sample could obscure education's effects on those who are more religious when they start college. In light of this, I estimate additional models that exclude individuals who are already highly secular. This allows me to focus on the effects of education on religiosity among those who are religious when they start college. This prevents the secular individuals from deflating the strength of the secularizing effects on which the literature has mainly focused. In a similar vein, it focuses on individuals with more conservative religious beliefs and asks if college makes them less conservative.

3.2.1.1 Dependent Variables

To capture the effects of change in education on change in religiosity, I create aggregate measures of conservative religious belief and religious practice using confirmatory factor analyses (CFA). These aggregate measures of belief and practice are constructed for each survey wave and are allowed to vary for each individual across the panels. The belief factor uses four variables. The first variable asks respondents: "To what extent do you consider yourself a religious person? Not Religious (0), Slightly Religious (1), Moderately Religious (2), and Very Religious (3)." The second collects information on respondents' views on God, asking "which statement comes closest to

expressing what you believe about God: I don't believe in God (0), I don't know whether there is a God and I don't believe there is any way to find out (1), I don't believe in a personal God, but I do believe in a Higher Power of some kind (2), I find myself believing in God some of the time, but not at others (3), While I have doubts, I feel that I do believe in God (4), and I know God really exists and I have no doubts about it (5)." Thirdly, the respondents' views about the Bible are tapped by asking: "Which of these statements comes closest to describing your feelings about the Bible? The Bible is an ancient book of fables, legends, history, and moral precepts recorded by men (0), the Bible is the inspired word of God but not everything in it should be taken literally, word for word (1), and the Bible is the actual word of God and is to be taken literally, word for word (2)." The fourth and final component of the belief scale captures respondents' feelings on the punishment of sinners. The GSS asks respondents to disagree strongly (0), disagree somewhat (1), agree somewhat (2), or agree strongly (3) with the following statement: "Those who violate God's rules must be punished."

These four variables are combined using a CFA that allows the errors for each measured variable to correlate across each wave of the panels (ie.$COV(Bible_{time1}, Bible_{time2}, Bible_{time3}) \neq 0$, etc.). Additionally, I allow the error of the God variable and the religious person variable to covary at each time point. Table 4 shows the means, variances, standardized factor loadings, and fit statistics for this aggregate measure of conservative religious belief. (See appendix B for the structural

equation model specification for this CFA and the CFA on religious practice.) When modeling belief on the reduced dataset, I exclude individuals who reported the most non-religious values on all four of these items in at least one survey wave.[1]

The GSS also collects a variety of information about individuals' religious practice. I use a CFA of four of these variables to construct an aggregate measure of religious practice for each survey wave. The first variable is the same religious service attendance item I used in the previous chapter. The GSS also asks: "About how often do you pray? never (0), less than once a week (1), once a week (2), several times a week (3), once a day (4), and several times a day (8)." Beyond attendance and prayer, the GSS collects information about how often respondents "take part in the activities and organizations of a church or place of worship other than attending services," and this measure uses the same scale as the religious service attendance variable. Finally, the GSS asks respondents to disagree strongly (0), disagree somewhat (1), agree somewhat (2), or agree strongly (3) with the following statement: "I try hard to carry my religious beliefs over into all my other dealings in life." These four variables are combined using a CFA that creates three time-varying indices of religious practice. The CFA allows the errors for each measured variable to correlate across each wave of the panels. (ie. $COV(Attend_{time1}, Attend_{time2}, Attend_{time3}) \neq 0$, etc.). The religious life question was

[1] Formally: $Religious\ Person_{time1} + God_{time\,1} + Bible_{time1} + Sinners_{time1} \neq 0$ for each time point in this reduced sample.

Table 4: Selected Results from Confirmatory Factor Analyses on Conservative Religious Belief and Religious Practice

	Conservative Religious Belief[1]								
	Time1			Time2			Time3		
	Latent Means and Variances								
	Mean	Std. Mean	var.	Mean	Std. Mean	var.	Mean	Std. Mean	var.
Religious Belief	1.657***	.526	.430	1.626***	.380	.466	1.609***	.304	.488
	Factor Loadings								
	b	β	(SE)	b	β	(SE)	b	β	(SE)
Religious Person	1	.689	--	1	.706	--	1	.705	--
Belief in Bible	0.771***	.715	(.017)	0.771***	.747	(.017)	0.771***	.751	(.017)
Belief in God	1.590***	.752	(.033)	1.590***	.781	(.033)	1.590***	.780	(.033)
Belief about Sinners	0.822***	.534	(.023)	0.822***	.551	(.023)	0.822***	.559	(.023)
	Religious Practice[2]								
	Time1			Time2			Time3		
	Latent Means and Variances								
	Mean	Std. Mean	var.	Mean	Std. Mean	var.	Mean	Std. Mean	var.
Religious Practice	3.589***	1.573	5.203	3.640***	1.552	5.502	3.569***	1.531	5.437
	Factor Loadings								
	b	β	(SE)	b	β	(SE)	b	β	(SE)
Religious Service Attendance	1	.810	--	1	.837	--	1	.825	--
Frequency of Prayer	0.497***	.666	(.012)	0.497***	.676	(.012)	0.497***	.671	(.012)
Religious Activities	0.711***	.690	(.012)	0.711***	.704	(.012)	0.711***	.698	(.012)
Religion in Life	0.255***	.625	(.006)	0.255***	.641	(.006)	0.255***	.643	(.006)

Standard Errors in parentheses; N=4,023; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[1] Model Fit: $\chi^2(405)$ 2,472.608, p < .000; RMSEA = 0.019; CFI = 0.997; TLI = 0.995; BIC = -245.246

[2] Model Fit: χ^2 (39) 624.852, p < .000; RMSEA = 0.061; CFI = 0.977; TLI = 0.961; BIC = 301.197

not asked in 2012, so my models do not use that information from wave 3 of the 2008 panel. The modeling strategy implemented here treats this as missing data and makes use of the available information to model the 2012 responses to this item. If I exclude this variable from the religious practice scale, the substantive results are not qualitatively different. Additionally, I allow the errors of the attendance and religious activity variables as well as the prayer and religious life variables to covary at each time point. Table 4 shows the means, variances, standardized factor loadings, and fit statistics for this aggregate measure of religious belief. When modeling belief on the reduced dataset, I exclude all individuals who reported the lowest religious practice level on all of these items in at least one survey wave.[2]

3.2.1.2 Key Independent Variables

The GSS also collects information about individuals' educational degree attainment, asking respondents a set of questions about the highest educational degree they have completed. The GSS compiles this into a variable with five categories: "less than high school (0), high school (1), junior college (2), bachelor's degree (3), and advanced degree (4)." These ordered groups are mutually exclusive, and I use this measure to create three dummy indicators – junior college degree, bachelor's degree, and graduate degree – to capture whether adding a college degree is associated with any

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[2] Formally: $Attendance_{time1} + Religious\ Activity_{time\ 1} + Prayer_{time1} + Religious\ Life_{time1} \neq 0$ for each time point in this reduced sample.

change in religious belief or practice. About 19 percent of Americans in the GSS panels have a bachelor's degree, and 10 percent have an advanced degree of some sort. Moreover, there is some meaningful change in the highest degree completed variables across these panels. About 450 (12 percent) of this sample completed a degree during these panels, with about 3 percent completing a junior college degree, 5 percent completing a bachelor's degree, and 3 percent completing a graduate degree.

3.2.1.3 Control Variables

The models presented here control for several time-varying measures to adjust for individual differences in religious belief and practice. Change in family structure has been shown to affect religious practice (Schleifer and Chaves 2014) and the models presented here control for marriage with an indicator of whether respondents are currently married, and parenthood with an indicator for whether respondents have ever had a child.

Religious switching is commonplace (Roof 1989; Sherkat 1991; Sherkat and Wilson 1995; Loveland 2003) and may affect individual levels of religiosity. To control for variation in religious belief and practice by denomination, I use the same modified version of the religious tradition scheme that I used in the previous chapter. Here, though, those reporting no religious affiliation, rather than evangelicals, will be the reference group. Also, I do not include the indicator of religious switching because I

treat these religious tradition variables as time-varying indicators to account for this type of change in the GSS panels.

The full models also control for several time-invariant measures to adjust for individual differences in religious belief and practice along demographic lines. To control for gender, I include a dichotomous indicator for female respondents. Race is captured by two binary indicators for black (1) and other race (2) with white as the comparison group. Finally, I include a time-invariant indicator for the 2008 panel to control for any potential difference across these two GSS panels.

3.2.2 Analytical Strategy

These longitudinal data provide better leverage for examining higher education's effects on religiosity because they capture between-individual variation (like the variation available in cross-sectional data) as well as within-person variation as respondents change over time. Using random- and fixed-effects models exploits both of these forms of variation to uncover whether individual change or between-individual comparisons are driving the relationship between education and religiosity. Random-effects models use both between- and within-individual variation and therefore use more information than fixed-effects models. However, random-effects models assume that the within-person effects and between-person effects are the same, and they constrain these two sources of variation to produce the same coefficients (Allison 2005; Allison 2009). This can led to misspecification if the between-individual effects are

different than the within-individual effects. Moreover, random-effects models do not account for any unobserved time-invariant characteristics of the respondent because these models assume that unobserved variables are uncorrelated with the model error (Allison 2005; Allison 2009), and this assumption increases the risk of omitted variable bias.

Fixed-effects models, on the other hand, focus exclusively on individual change over time (within-person variation). Focusing on within-person variation effectively allows each individual to act as a statistical control for him- or herself, which thereby controls for all time-invariant correlates, including those that are unobserved (Morgan and Winship 2007; Allison 2009). Fixed-effects models increase our confidence that there is no unmeasured prior variable that is causing change in religiosity.

Fixed-effects models come with certain analytical costs. In particular, there is a reduction in statistical power because fixed-effects models discard between-individual variation. I also run mixed-effects models that capture the within-individual effects for the time-varying covariates while also including time-invariant covariates that compare individuals across substantively interesting groups. This takes advantage of both fixed- and random-effects approaches by isolating within-individual variance for the time-varying variables of interest while also modeling between-individual differences within the same model structure. Furthermore, because these models are nested within the fixed-effects approach (Cheung 2008; Bollen and Brand 2010), I can formally test model

fit across several structural equation model (SEM) fit statistics to assess which model best fits the data.

To examine gender differences, I use multiple group analysis. Multiple group analysis is ideal for this purpose because this approach allows the analyst to examine model parameters across each subgroup to see which can be treated as equal and which are different for men and women (Bollen and Curran 2006; Bollen and Brand 2010). This allows me, within a single model framework, to address the question of whether education's effect on religiosity is different for men and women.[3]

3.2.2.1 Analyses

All models reported here represent a particular type of the general panel model that can be fit using SEMs (Bollen 1989; Bollen and Brand 2010). These models were estimated in STATA 13 (2013) using the full information maximum likelihood (FIML) estimator to adjust for missing data. FIML adjusts for missing data by computing the likelihood function for each case using only the non-missing information in the construction of the covariance matrix. This approach to missing data has several desirable properties including consistency, asymptotic unbiasedness, asymptotic

[3] While not presented here, formal tests of the measurement models for my aggregate measures of conservative religious belief and religious practice show a preference for the same loadings for both men and women while also showing meaningful variation in mean level of belief and practice along gender lines. This provides additional reason to explore the differential effect of education on religiosity by gender.

normality, and asymptotic efficiency, all of which allow for χ^2 tests of overall model fit (Bollen 1989; Arbuckle 1996; Allison 2003; Enders 2010).

3.3 Results

3.3.1 Random-, Fixed-, and Mixed-Effects Models of Conservative Religious Belief

Table 5 presents a series of random-, fixed-, and mixed-effects regressions of conservative religious belief on college degree completion. The full sample models use the entire combined GSS panel sample while the religious sample looks at only those individuals who report some degree of conservative religious belief during each panel wave. This reduced sample excludes 101 individuals whose beliefs are completely secular.

The first model for each sample is a random-effects model and results here can be interpreted as the effects of having or completing a college degree on conservative religious belief. Random-effects models make use of both between- and within-individual variance, and this runs the risk that between-individual differences are mistaken for within-individual change over time. The fixed-effects model take full advantage of the additional variation in longitudinal data by focusing only on within-individual change over time. The results for these models can be interpreted as the effect of adding a college degree on change in religious belief. I place these models side by side to show how the story changes depending on whether the models focus on comparing individuals one to another or individuals changing over time. Finally, the mixed-effects

model combines the previous two approaches. For the time-varying variables, the mixed-effects model looks only at within-individual differences, and for the time-invariant variables these models capture only between-individual differences. All of the coefficients here have been standardized to make interpretation easier. A significant coefficient means that for one standard deviation change in our predictors, the model predicts a standard deviation change in the aggregate outcome measures.

The random-effects models show all the expected correlations between education and religious belief we would expect from cross-sectional studies. For the full sample, we can see that those with a bachelor's degree or an advanced degree show lower rates of conservative religious beliefs. Those with a bachelor's degree report, on average, a 0.124 standard deviation lower predicted conservative religious belief. Those with an advanced degree show a slightly larger effect, reporting about a 0.14 standardized lower rate of conservative religious belief compared to those with no college education. Comparing those in the full sample to those in the religious sample shows very little difference in the effect sizes. This suggests that, in a framework that combines both between- and within-individual variation, the secular individuals in the sample do not appear to be deflating the size of the effects. Overall, the random-effects models show strong negative association between educational attainment and conservative religious belief, holding several important controls constant.

Table 5: Selected Results from Random-, Fixed-, and Mixed-effects Regressions of Conservative Religious Belief on Educational Degree Attainment

	Full Sample			Religious Sample		
	Random[1]	Fixed[2]	Mixed[3]	Random[4]	Fixed[5]	Mixed[6]
Junior College	-0.013	0.007	0.007	-0.016	0.005	0.005
	(.010)	(.010)	(.010)	(.010)	(.011)	(.011)
Bachelor's Degree	-0.124***	-0.027	-0.026	-0.130***	-0.041*	-0.041*
	(.012)	(.017)	(.017)	(.013)	(.019)	(.019)
Advanced Degree	-0.139***	-0.036*	-0.036*	-0.139***	-0.054**	-0.054**
	(.012)	(.018)	(.018)	(.013)	(.020)	(.020)
Religious Tradition						
Evangelical	0.45***	.136***	0.137***	0.449***	.146***	0.147***
	(.016)	(.015)	(.015)	(.017)	(.016)	(.016)
Mainline Prot.	0.301***	.115***	0.116***	0.293***	.124***	0.125***
	(.014)	(.014)	(.012)	(.015)	(.015)	(.015)
Catholic	0.324***	.138***	0.139***	0.301***	.138***	0.139***
	(.016)	(.019)	(.012)	(.017)	(.021)	(.021)
Other Traditions	0.151***	.012***	0.072***	0.149***	.076***	0.075***
	(.012)	(.012)	(.012)	(.012)	(.013)	(.013)
Married	0.044***	-0.019	-0.020	0.037**	-0.026	-0.026
	(.013)	(.016)	(.015)	(.013)	(.016)	(.016)
Parenthood	0.091***	-0.017	-0.016	0.096***	-0.017	-0.016
	(.013)	(.019)	(.019)	(.014)	(.020)	(.020)
Female	0.182***		0.196***	0.171***		0.182***
	(.015)		(.015)	(.016)		(.016)
Race						
Black	0.185***		0.194	0.179***		0.190***
	(.015)		(.016)	(.016)		(.017)
Other Race	0.045**		0.027	0.050**		0.029
	(.016)		(.016)	(.018)		(.017)
Panel	-0.023	-0.026	-0.025	-0.018	-0.021	-0.012
	(.015)	(.016)	(.015)	(.016)	(.017)	(.016)
N		4,023			3,922	

Standardized Coefficients; Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[1] Model Fit: $\chi^2(405)$ 2,472.61, $p < .000$; RMSEA = 0.04; CFI = 0.091; TLI = 0.906; BIC = -888.80

[2] Model Fit: $\chi^2(346)$ 1,081.48, $p < .000$; RMSEA = 0.02; CFI = 0.969; TLI = 0.964; BIC = -1,790.25

[3] Model Fit: $\chi^2(378)$ 1,198.58, $p < .000$; RMSEA = 0.02; CFI = 0.966; TLI = 0.960; BIC = -1,938.73

[4] Model Fit: $\chi^2(405)$ 2,145.00, $p < .0000$; RMSEA = 0.03; CFI = .914; TLI = 0.907; BIC = -1,206.11

[5] Model Fit: $\chi^2(345)$ 1,047.65, $p < .000$; RMSEA = 0.02; CFI = 0.965; TLI = 0.959; BIC = -1,807.01

[6] Model Fit: $\chi^2(378)$ 1,165.31, $p < .000$; RMSEA = 0.02; CFI = 0.961; TLI = 0.955; BIC = -1,962.40

With random-effects models, however, there is a strong risk that between-individual differences do not represent within-individual change over time and therefore do not indicate true causal effects. The fixed-effects models focus solely on within-individual change and tell a slightly different story about the relationship between degree attainment and religious belief. The coefficients in these models can be interpreted as the change in an individual's conservative religious belief if he or she completes an educational degree. From the model using the full sample, there is a large decrease in the effect size when focusing on individual change. This means that in this modeling framework, there is no associated change in religious belief upon the completion of a bachelor's degree. In the full sample, there is a small effect of completing an advanced degree. Here those individuals who complete an advanced degree during this panel show 0.04 standardized decrease in their conservative religious belief. Focusing on within-individual differences leads to about a three-fold decrease in the overall magnitude of the effect of having an advanced degree on conservative religious belief.

The fixed-effects model on the religious sample also shows a decrease in overall effect size. Among those who have some conservative religious beliefs to start with, this model shows that completing a bachelor's or an advanced degree is significantly related to individuals decreasing their religious beliefs. However, it appears again that the general reliance on cross-sectional models and data has greatly inflated the size of the

causal relationship between education and religiosity. The effect size of completing a bachelor's degree is about two times smaller when focusing on individual change compared to the combination of within- and between-individual differences among this religious sample. Additionally, these within-individual models decrease the effect size of completing an advanced degree by 157 percent. Both of these comparisons are replicated in the mixed-effect models that include both time-variant and time-invariant predictor variables.

This difference in worth dwelling upon. There are several scholarly and popular works that see education and science as being epistemologically opposed to some forms of religion (see Evans and Evans 2008 for an overview). The strong correlation between degree attainment and lower rates of religiosity is a core piece of evidence for those arguing that conservative religious beliefs are incompatible with higher education. While my analyses do detect some effects here, the size and magnitude of these effects are greatly reduced when modeling individual change directly. Indeed, the overall decrease in magnitude suggests that much of the strong language used in these debates is perhaps inappropriate. This analysis suggests that some combination of unobserved variable bias and/or causation in the opposite direction produces the large negative relationship between higher education and religiosity captured in cross-sectional models. All in all, these models suggest that approximately two-thirds of the

relationship between education and religious belief is attributable to between-individual differences that should not be interpreted causally.

3.3.2 Random-, Fixed-, and Mixed-Effect Models of Religious Practice

Table 6 presents a series of random-, fixed-, and mixed-effect regressions of religious practice on my college degree variables. The full sample models use the entire combined GSS panel sample while the religious sample looks at only those individuals who report some degree of religious practice during each panel wave. This reduced sample excludes 230 individuals who are completely secular in terms of their religious practice.

None of these models indicate strong effects of college degree completion on individuals' religious practice. In the full sample, the random-effects model shows a slightly higher rate of religious practice among those with a junior college degree. This effect shows the modest increase of a 0.02 standard deviation increase in religious practice for those who hold this type of college degree. Those who complete a junior college degree, as shown in the fixed- and mixed-effect models on the full sample, do not experience any meaningful change in their rates of religious practice. The models using the religious sample show the same pattern of small effects as the models on the full sample that include the between-individual comparison. The random-effects model shows that those with college degrees engage in religious practice more than those

Table 6: Selected Results from Random-, Fixed-, and Mixed-effects Regressions of Religious Practice on Educational Degree Attainment

	Full Sample			Religious Sample		
	Random[1]	Fixed[2]	Mixed[3]	Random[4]	Fixed[5]	Mixed[6]
Junior College	0.024**	0.018	0.018	0.028**	0.022*	0.022*
	(.009)	(.010)	(.010)	(.010)	(.019)	(.011)
Bachelor's Degree	0.004	-0.010	-0.010	0.030*	-0.008	-0.008
	(.012)	(.016)	(.016)	(.013)	(.018)	(.018)
Advanced Degree	0.014	0.004	0.003	0.041**	0.005	0.005
	(.012)	(.017)	(.017)	(.013)	(.019)	(.019)
Religious Tradition						
Evangelical	0.359***	0.149***	0.150***	0.333***	0.162***	0.162***
	(.015)	(.014)	(.014)	(.016)	(.016)	(.016)
Mainline Prot.	0.241***	0.107***	0.108***	0.215***	0.113***	0.115***
	(.013)	(.013)	(.013)	(.014)	(.015)	(.015)
Catholic	0.228***	0.069***	0.069***	0.187***	0.059**	0.060**
	(.016)	(.018)	(.018)	(.017)	(.021)	(.021)
Other Traditions	0.164***	0.096***	0.096***	0.158***	0.106***	0.106***
	(.011)	(.011)	(.011)	(.012)	(.110)	(.013)
Married	0.072***	0.002	0.002	0.078***	0.005	0.004
	(.012)	(.014)	(.014)	(.013)	(.016)	(.016)
Parenthood	0.086***	0.014	0.014	0.070***	0.005	0.004
	(.013)	(.018)	(.018)	(.014)	(.021)	(.021)
Female	0.200***		0.211***	0.183***		0.185***
	(.016)		(.016)	(.017)		(.017)
Race						
Black	0.182***		0.170***	0.165***		0.147***
	(.016)		(.016)	(.017)		(.017)
Other Race	0.004		-0.002	-0.001		-0.007
	(.016)		(.016)	(.017)		(.018)
Panel	-0.023	-0.025	-0.018	-0.020	-0.023	-0.017
	(.016)	(.016)	(.016)	(.017)	(.017)	(.017)
N		4,023			3,793	

Standardized Coefficients; Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[1] Model Fit: $\chi^2(402)$ 2,706.35, p < .000; RMSEA = 0.04; CFI = 0.918; TLI = 0.911; BIC = -630.166

[2] Model Fit: $\chi^2(342)$ 1,668.67, p < .000; RMSEA = 0.03; CFI = 0.952; TLI = 0.944; BIC = -1,443.75

[3] Model Fit: $\chi^2(375)$ 1,819.44, p < .000; RMSEA = 0.03; CFI = 0.949; TLI = 0.940; BIC = -1,019.09

[4] Model Fit: $\chi^2(402)$ 2,053.02, p < .000; RMSEA = 0.03; CFI = 0.927; TLI = 0.921; BIC = -1,259.83

[5] Model Fit: $\chi^2(342)$ 1,333.50, p < .000; RMSEA = 0.03; CFI = 0.956; TLI = 0.948; BIC = -1,484.90

[6] Model Fit: $\chi^2(375)$ 1,509.46, p < .000; RMSEA = 0.03; CFI = 0.950; TLI = 0.941; BIC = -1,580.88

who do not have a degree, but the rates of practice are only slightly higher. The within-individual model shows a small positive effect of completing a junior college degree, but overall, it does not appear that completing a college degree leads to any meaningful change in individuals' religious practice. In general, this suggests that college education does not affect religious practice to any great degree. However, in the multiple group analyses by gender, I show that there is a rather substantial gender difference in both the between- and within- individual effects of college degree attainment on religious practice and on conservative religious belief.

3.3.3 Multiple Group Analyses by Gender

Figure 1 presents selected coefficients from random- and fixed-effects regressions of religious belief, with parameters estimated separately for men and women, using the religious sample. The top panels compare the effects of college degree completion among women using both the between- and within-variation in the random-effects models and focusing solely on within-individual change in the fixed-effects model. The bottom panels do the same for men. This figure shows that when using models that focus on both within- and between-individual differences, the relationship between education and religious belief is largely the same for men and women. Those with a bachelor's degree or an advanced degree show lower rates of religious belief compared to those with no college degree for both men and women. Moreover, the magnitude of these effects is virtually the same across gender.

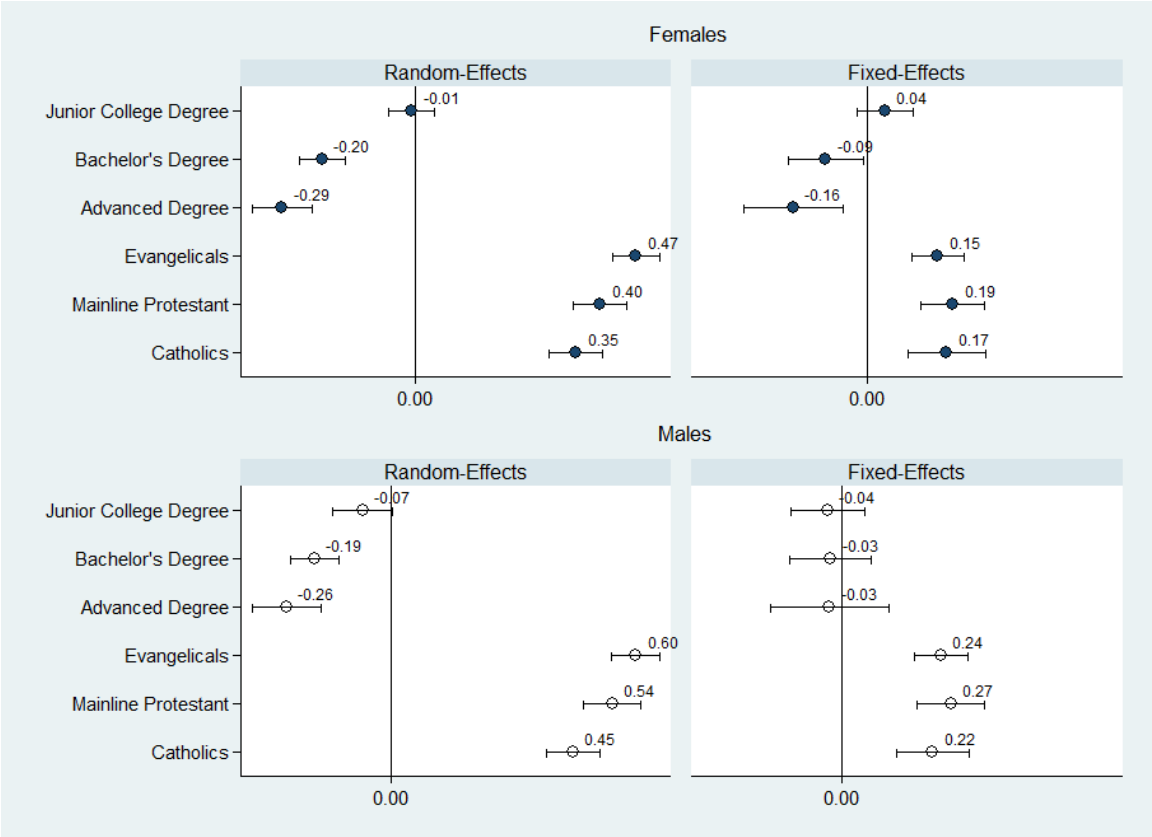

Figure 1: Selected Random- and Fixed-Effects Coefficients from a Regression of Conservative Religious Belief on College Degree Attainment by Gender

The models focusing on individual change, however, show an important gender difference that is obscured in the cross-sectional approaches usually used to study this relationship. Comparing the fixed-effects models for men and women shows that the within-individual relationship between completing a college degree and change in religious belief is very different across gender. Men show no significant effects of completing an educational degree on change in their religious belief, but women who complete college degrees become significantly less conservative in their religious beliefs. For women who complete a bachelor's degree, there is a 0.09 standard deviation

decrease in their conservative religious belief. Completing an advanced degree leads to 0.16 standardized decrease in women's conservative religious belief. These results are surprising because there is very little literature looking at the differential effects of education on religion by gender. This is a fascinating gender difference that has largely remained unexplored because of the general reliance on cross-sectional data and models to study these associations. Using these longitudinal models uncovers an important gender difference that remains under-theorized.

Figure 2 presents analogous results for religious practice. Looking at the random-effects models, this figure shows that a positive relationship between education and religious practice is present for men but not for women. It appears that men who have a college degree have higher rates of religious practice compared to those men without a college degree. Among women, however, there is no difference in religious practice between those with a college degree and those without a degree. This difference, again, has been unexplored in earlier research because of the reliance on cross-sectional data and models. There also is important gender variation in the fixed-effects models. Women who completed a bachelor's degree *decreased* their rates of religious practice. Indeed, while the effects of completing a junior college degree or an advanced degree are not significant in this model, the general pattern suggests that educational attainment decreases religious practice among women. Among men,

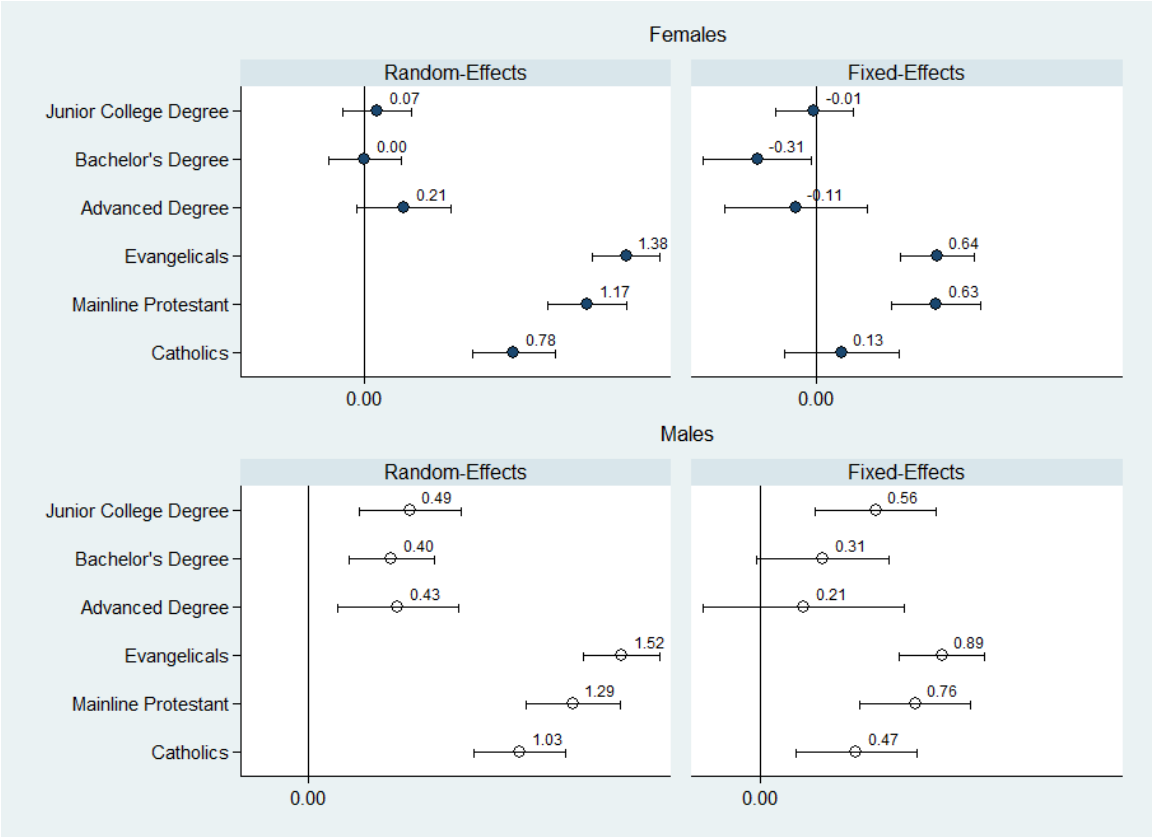

Figure 2: Selected Random- and Fixed-Effects Coefficients from a Regression of Religious Practice on College Degree Attainment by Gender

however, the general pattern suggests the opposite – education attainment leads them to increase their religious practice. This suggests that the well-known and well-established observation that more educated Americans are more religiously active obscures a causal story that may be quite different for women than it is for men.

3.4 Conclusions

This chapter suggests both substantive and methodological conclusions. Overall, it appears that completing a college degree decreases conservative religious beliefs. However, these longitudinal approaches show that the size of these associations is much

smaller than we have been led to believe from cross-sectional models. Moreover, the approaches that maximize the additional information in longitudinal data show that the negative effect of education on religious belief is primarily experienced by women. This is an important finding that has not been observed in cross-sectional approaches to this association. There also are important gender differences in college education's effects on religious practice. For women, degree completion leads to lower rates of religious practice while the opposite is true for men. Without these longitudinal models, we are left to believe that the effects of education on religiosity are similar for both men and women. The approaches presented here demonstrate that this is not the case. The theory that motivates the study of education's effects on religion needs to be adjusted to account for this gender variation.

There is a second way that this study allows us to re-assess previous sociological accounts of education's effects on religion. There is a large literature on the differential effects of college education for men and women on several kinds of outcomes, such as the greater economic returns of college degree attainment for men (Pascarella and Terenzini 2005). This chapter shows that this list should be expanded to include religion. It appears that education has a secularizing effect for women, but far less so for men. It may be that conservative religious belief comes under greater scrutiny as a part of a general liberalizing effect of education that is greater for women than for men, and decreased religiosity is just a by-product of that liberalization. Another possibility is that

women are more religious than men to start with. It is well known that women are more active in religion and express greater levels of religious belief than men (Swatos 1994; Braude 1997; Sullins 2006). This higher starting level of religiosity may mean that education has more ability to change women's religious lives because men already are more secular when they enter college.

Yet another possibility is that the different types of degrees that men and women pursue in college lead to different effects on religiosity. According to the 2013 Digest of Educational statistics (Snyder and Dillow 2013), 57 percent of all bachelor's degrees conferred in 2012 were given to women. Women, however, accounted for only 19 percent of engineering degrees, 18 percent of computer and information sciences degrees, and 43 percent of mathematics and statistic degrees. These are domains where religion is not an object of study. They are intellectual fields within the academy that, on the whole, will not directly call religious beliefs or practices into question. In areas such as the social sciences (51 percent female), psychology (77 percent female), English (88 percent female), and Education(79 percent female), by contrast, gendered religious beliefs embedded within certain religious traditions are more likely to become an object of study and come under direct scrutiny. Future research will need to untangle what might be driving this gender difference.

Using longitudinal models shows that the relationship between college degree completion and religiosity is much weaker than cross-sectional analyses would suggest.

Also important, however, is the conclusion that comparing between-individual and within-individual analyses can help us both re-assess conventional wisdom in the sociology of religion and raise new questions that did not occur to scholars using an earlier generation of methodological approaches.

Appendix A

This appendix includes all of the structural equation model path diagrams for the LCMs run in chapter 2.

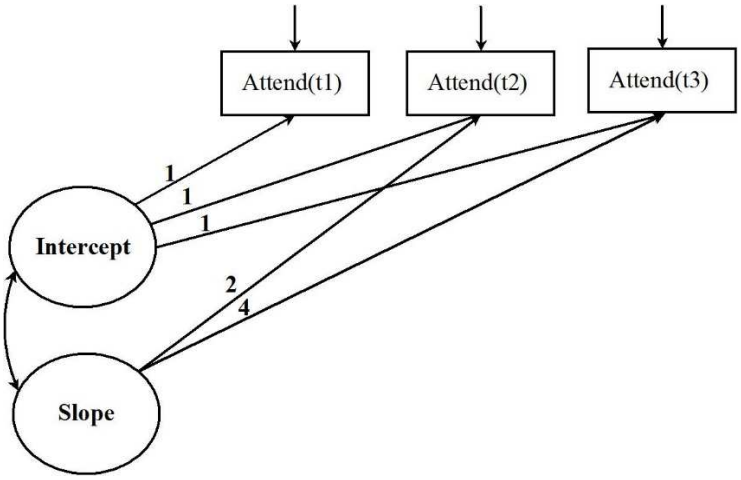

Figure 3: Unconditional LCM on Religious Service Attendance

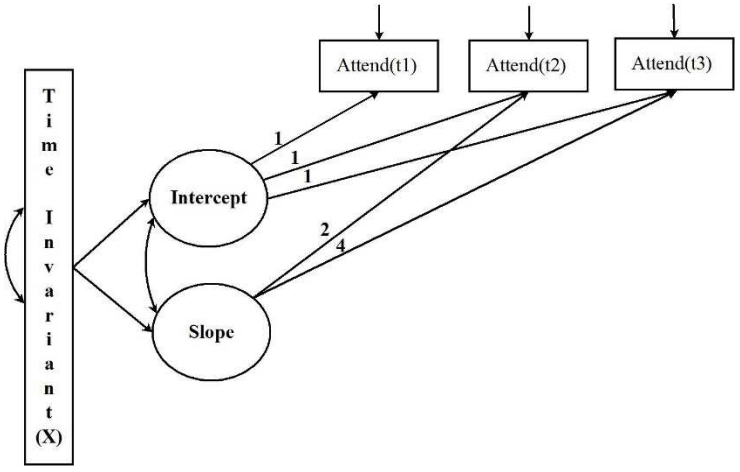

Figure 4: Conditional LCM with Time-Invariant Covariates of Religious Service Attendance

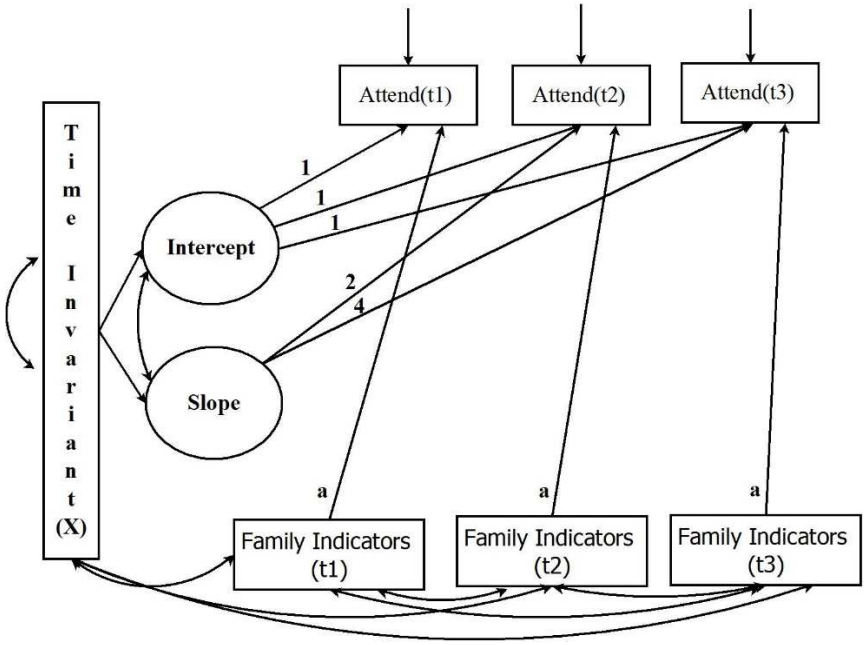

Figure 5: Standard Conditional LCM with Time-Varying and Time-Invariant Covariates on Religious Service Attendance

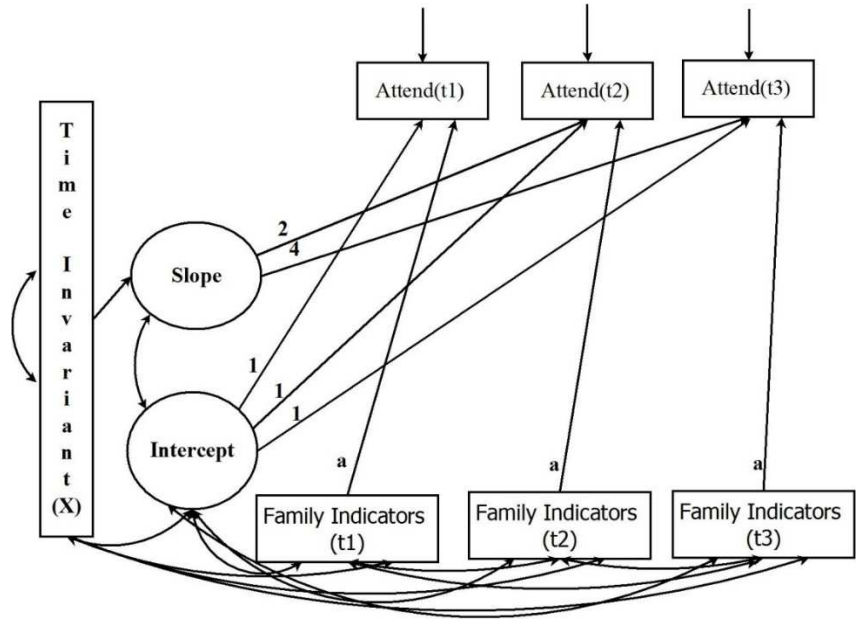

Figure 6: Within-Individual Conditional LCM with Time-Varying and Time-Invariant Covariates on Religious Service Attendance

Appendix B

This appendix includes all of the structural equation model path diagrams for CFAs and Regression models from chapter 3.

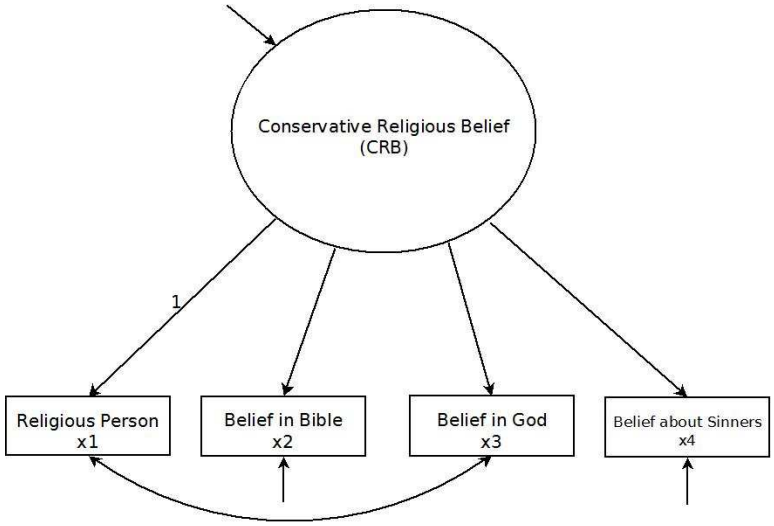

Figure 7: Single Time Point Confirmatory Factor Analysis of Conservative Religious Belief

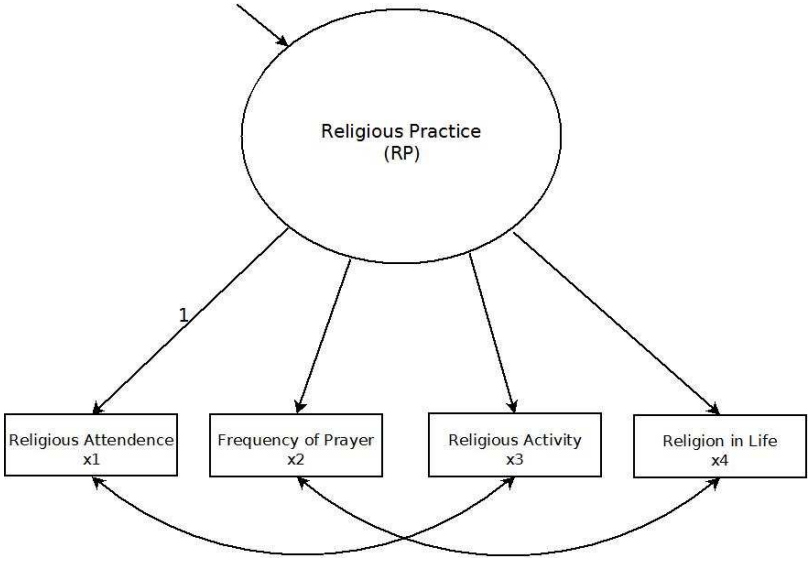

Figure 8: Single Time Point Confirmatory Factor Analysis of Religious Practice

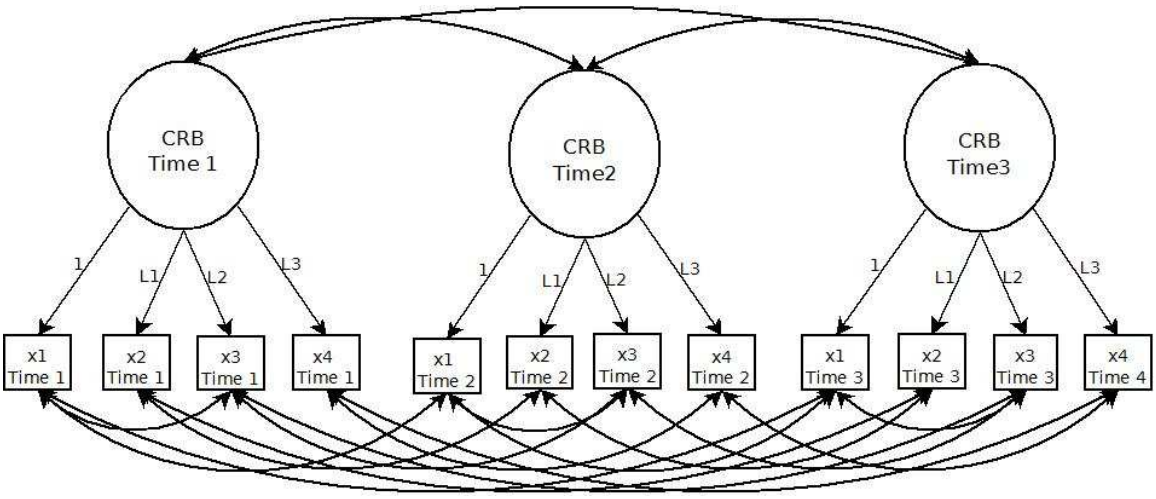

Figure 9: Three Time Point Confirmatory Factor Analysis of Conservative Religious Belief

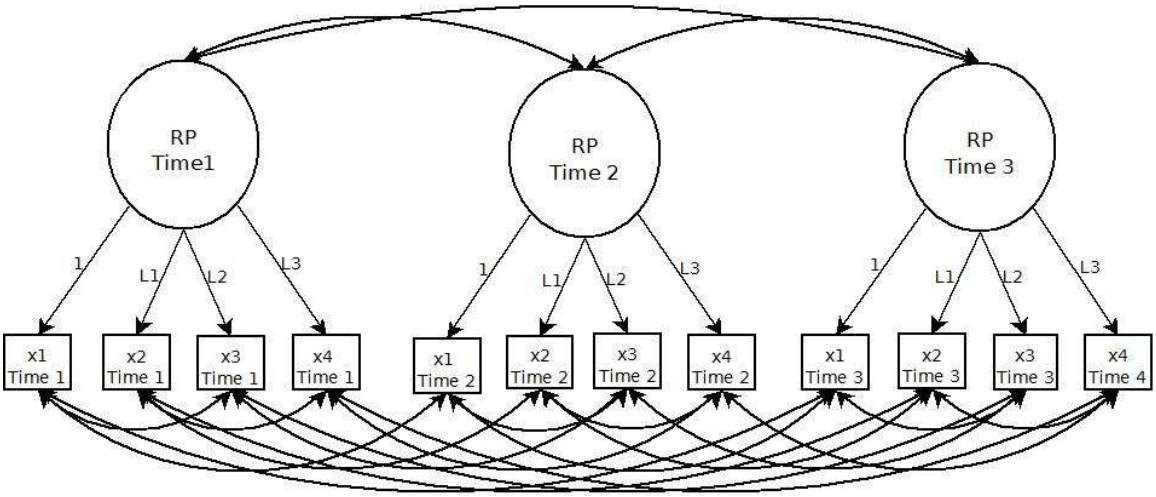

Figure 10: Single Time Point Confirmatory Factor Analysis of Religious Practice

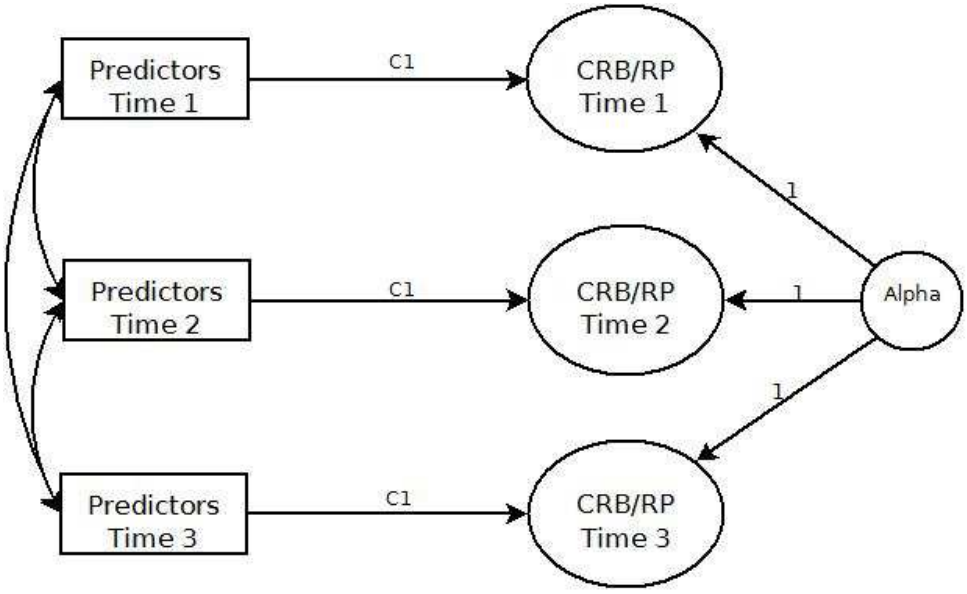

Figure 11: Random-Effects Regression of Conservative Religious Belief and Religious Practice

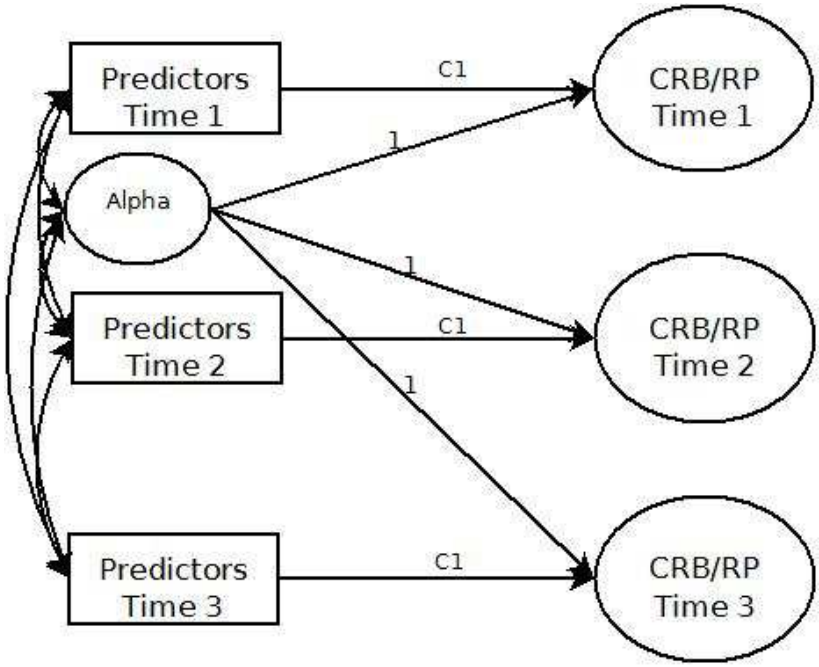

Figure 12: Fixed-Effects Regression of Conservative Religious Belief and Religious Practice

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