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## Period and Cohort Effects on Religious Nonaffiliation and Religious Disaffiliation: A Research Note

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Period and cohort effects on reports of no religious preference and religious disaffiliation are estimated. Results show that by 2006, the probability of reporting no religious preference had risen to almost 0.16. Additionally, the growing proportion of Americans raised with no religious preference substantially influences the increase in reporting no religious preference. Two recently developed analysis techniques for disentangling period and cohort effects are used: intrinsic estimator models and cross-classified, random-effects models. Results show (1) period-based increases in the probability of reporting no religious preference from 1990 to 2006, (2) across-cohort increases in no religious preference beginning with those born in the 1940s, and (3) a decline in the likelihood of religious disaffiliation (being raised with a religious preference but currently reporting no religious preference) for those born in the 1960s and 1970s compared to those born between 1945 and 1959.

Recent growth in religious nonaffiliation is altering the makeup of organized religion in the United States. After years of stability, the percentage of Americans reporting no religious preference doubled in the 1990s, from 7 percent to 14 percent (Hout and Fischer 2002). Additionally, younger birth cohorts are increasingly likely to be raised with no religious affiliation (Sherkat 2001), suggesting that cohort replacement may lead the proportion of Americans with no religious affiliation to continue to rise. I disentangle period and cohort effects on reporting no religious preference using repeated, cross-sectional data from 1973 to 2006. Updating previous research, findings indicate the probability of Americans reporting no religious preference has continued to increase, rising to close to 0.16 in 2006. I focus on the distinction between religious nonaffiliation (i.e., reporting no religious preference) and religious disaffiliation (i.e., raised with a religious preference but currently reporting no religious preference), and examine birth cohort and time-period differences in both religious nonaffiliation and religious disaffiliation. Two recently developed analysis techniques for disentangling period and cohort effects are used: intrinsic estimator models and cross-classified, random-effects models.

Americans who matured in the 1960s and later are the originators of what Wuthnow (1976) calls a "consciousness reformation" and what Bellah et al. (1985) call "Sheilism." These world-views include an increase in religious individualism and an aversion to traditional forms of organized religion. Similarly, Hout and Fischer (2002) propose a "1960s legacy" effect where all birth cohorts maturing into adulthood in the 1960s or later are disproportionately likely to disaffiliate from religion. Based on the following analysis, a 1960s legacy exists—Americans who were born in the latter half of the 1940s and in the 1950s, and were therefore children or young adults in the 1960s, are disproportionately likely to disaffiliate from religion. Although younger cohorts—born between 1965 and 1974—are relatively likely to be unaffiliated, they are considerably less likely than the 1945 to 1959 cohorts to disaffiliate from organized religion. In other words, the 1960s legacy appears to be declining across cohorts, though the influence of those who matured in and around the 1960s is evident in continued across-cohort increases in the proportion of Americans raised with no religious preference.

Acknowledgments: Many thanks to Jacob Cheadle, the editor of *JSSR*, and three anonymous reviewers.

## Data

I use 1973 through 2006 General Social Survey (GSS) data to examine changes in reporting no religious preference. The GSS is a nationally representative survey of noninstitutionalized American adults conducted annually or biennially from 1972 to 2006 (Davis, Smith, and Marsden 2007). The sample is limited to the 25 surveys conducted from 1973 to 2006 because the religious origin measures were not included in the 1972 survey.

From 1973 to 2006 the GSS asked: "What is your religious preference? Is it Protestant, Catholic, Jewish, some other religion, or no religion?" This question was also asked in relation to respondents' religious preferences when they were 16 years old. The primary dependent variable is a dichotomous variable, coded zero for respondents who report that they are currently Protestant, Catholic, Jewish, or some other religion and one for respondents who report no current religious preference. All respondents who report no current religious preference are considered unaffiliated or nonaffiliated. Respondents who report having a religious preference when they were 16 years old but currently have no religious preference are considered to have disaffiliated from religion.

## Analysis Techniques

I begin by analyzing across-cohort changes in being raised with no religious preference and changes over time in claiming no religious preference. The percent raised with no religious preference by birth cohort assesses across-cohort changes in being raised with no affiliation. Next, changes in non-affiliation over time are analyzed using binary logistic regression models of reporting no religious preference. In the binary logistic regression models, time is measured with dummy variables for each survey year from 1974 to 2006; 1973 is the reference category. Binary logistic regression models compute change in a dichotomous dependent variable in logged odds (Menard 1995). The use of logistic regression is consistent with previous analyses of no religious preference trends (e.g., Hout and Fischer 2002).

There is no "gold standard" for disentangling age, period, and cohort effects with repeated cross-sectional data. I employ two recently developed techniques. Both techniques are designed to adjust for the linear dependency between age, period, and cohort (i.e.,  $\text{period} - \text{age} = \text{cohort}$ ). First, Bernoulli cross-classified random-effects age-period-cohort models, which are also called hierarchical age-period-cohort models, adjust for the dependency between age, period, and birth cohort by treating cohort and period as cross-classified level-2 units in a multilevel model (Yang and Land 2006). Individuals are the level-1 unit of analysis. With this technique, individuals are nested in cohort-by-period cells. Random variance components for period and cohort intercepts establish variation from the mean for each period and cohort. These residual period and cohort differences from the overall mean can be interpreted as period-specific and cohort-specific coefficients.

Second, the intrinsic estimator is a special form of principal components regression estimator that adjusts for the linear dependency between age, period, and cohort through singular value decomposition of matrices (Yang, Fu, and Land 2004; Yang et al. 2008).<sup>1</sup> For a fixed number of periods, the intrinsic estimator provides unbiased estimates of regression coefficients for age, period, and cohort and it is more statistically efficient than methods that constrain data to avoid the identification problem associated with age-period-cohort analyses (see Yang et al. [2008] for a detailed description of the properties of the intrinsic estimator). Both the Bernoulli cross-classified random-effects models and the intrinsic estimator models report results in logged odds.<sup>2</sup>

<sup>1</sup>In contrast to traditional regression techniques, that cannot be estimated using measures of age, period, and cohort where  $\text{period} - \text{age} = \text{cohort}$ , the intrinsic estimator meets conditions of estimability by removing the effect of the null space on the design matrix (Yang, Fu, and Land 2004).

<sup>2</sup>A logit link function is used to make the intrinsic estimator models suitable for a dichotomous dependent variable.

In the age-period-cohort models, age, period, and birth cohort are coded into roughly five-year intervals, resulting in 10 age groups, six periods, and 15 cohorts born between 1890 and 1974.<sup>3</sup> Since my goal is to identify period and cohort changes in reporting no religious preference rather than to explain changes in reporting no religious preference across periods or cohorts, the age-period-cohort models do not contain any control variables.<sup>4</sup> While many Americans, particularly baby boomers, temporarily drop out of religion when they are young adults, most “return to the fold” by their late 20s or not at all (Roof 1993). I focus on period and cohort effects on more substantial forms of nonaffiliation rather than this more common, temporary form of nonaffiliation that often accompanies the liminality of young adulthood. Consequently, the sample for age-period-cohort analyses is limited to respondents at least 30 years old.<sup>5</sup> For ease of interpretation, I convert the results from all regression models into probabilities that are shown in Figures 2 through 5. Binary logistic regression and intrinsic estimator models are weighted to adjust for the subsampling of nonrespondents as well as variations in the number of adults per household and other sampling variations. The statistical software (HLM 6) does not allow weight variables in cross-classified models.<sup>6</sup>

## Results

### Cohort Changes in Being Raised Nonaffiliated

As Figure 1 shows, the percentage of Americans raised with no religious preference grew a great deal in recent birth cohorts. There is little change across cohorts in the percent raised with no religious preference for those born between 1890 and 1954 (other than the relatively high percent for the 1930-1934 cohort). Every birth cohort after the 1950-1954 cohort, however, is more likely than the preceding cohort to be raised with no religious preference. The percent raised with no affiliation ranges between 2 and 4 percent for those born between 1890 and 1954. The percent raised with no affiliation then increases to between 5 and 6 percent for the 1955-1959 and 1960-1964 cohorts, more than 8 percent for the 1965-1969 cohort, more than 9 percent for the 1970-1974 cohort, more than 11 percent for the 1975-1979 cohort, and more than 14 percent for the 1980-1984 cohort. These results suggest that the recent growth in reporting no religious preference is partially due to an increase in Americans being raised with no affiliation.

### Changes in Nonaffiliation from 1973 to 2006

The solid line in Figure 2 shows the probability of reporting no religious preference from 1973 to 2006. This line graphs a regression of reporting no religious preference with dummy variables for each survey year as independent variables. The probability of reporting no religious preference remains relatively stable from the early 1970s through the end of the 1980s but then increases substantially from the early 1990s to 2006, going from just over 0.06 in 1991 to close to 0.16 by 2006.

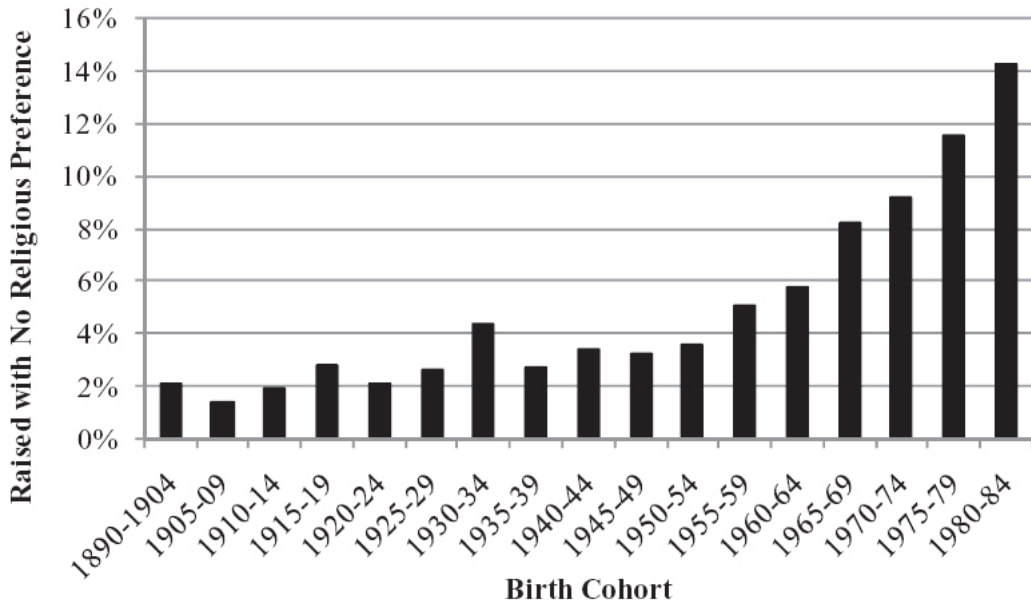
<sup>3</sup>As Yang et al. (2008) note, while the choice of intervals is somewhat arbitrary, five-year birth cohorts are the norm in age-period-cohort analyses. Following Yang et al. (2008), I group respondents 75 years old or older into a single age category for more stable estimates. Due to the small number of respondents from older cohorts, I also group respondents born between 1890 and 1904 into a single cohort category for more stable estimates. The final exception to the five-year interval guideline is the inclusion of the 1973 and 1974 surveys with the 1975 through 1978 surveys as a single time period and the inclusion of the 2006 survey with the 2000 through 2004 surveys as a single period.

<sup>4</sup>The only variables in the intrinsic estimator models are age, period, and cohort. Dummy variables for five-year age intervals (30-34 is reference category) are the only fixed-effects coefficients in the cross-classified models since period and cohort effects are based on residual variance components.

<sup>5</sup>Figure 1 and Figure 2 are based on a sample that includes respondents below 30 years old. The goal of the analysis presented in Figure 1 is to identify cohort changes in being raised unaffiliated that should not be influenced by age. The goal of the analysis shown in Figure 2 is to establish overall time changes in nonaffiliation, which to be comparable with previous analyses of time effects on nonaffiliation (e.g., Condran and Tamney 1985; Glenn 1987) should include respondents below 30 years old.

<sup>6</sup>The standard methodology in cross-classified, random-effects age-period-cohort models using GSS data is to exclude weight variables from the analysis (e.g., Yang 2008; Yang and Land 2008). Results from unweighted intrinsic estimator models are similar to those presented in this article.

Figure 1. Percent raised with no religious preference by birth cohort, GSS 1973-2006



Note:  $N = 45,116$ ; respondents born before 1890 or after 1984 deleted from sample; cases missing data on current religion or religion raised in deleted from sample.

The dashed line in Figure 2 represents the estimated probability of reporting no religious preference if only 3 percent of respondents were raised with no religious preference. This line graphs a model predicting nonaffiliation with dummy variables for each year and a dummy variable for raised nonaffiliated as independent variables. The raised nonaffiliated variable is constrained to 0.03 to simulate the probability of being raised nonaffiliated that is common among older cohorts (see Figure 1). If only 3 percent of respondents were raised with no affiliation, then the estimated probability of disaffiliation remains below 0.12 rather than approaching 0.16. These results indicate that a substantial proportion of the increase in nonaffiliation is due to an increase in Americans being raised with no religious preference.

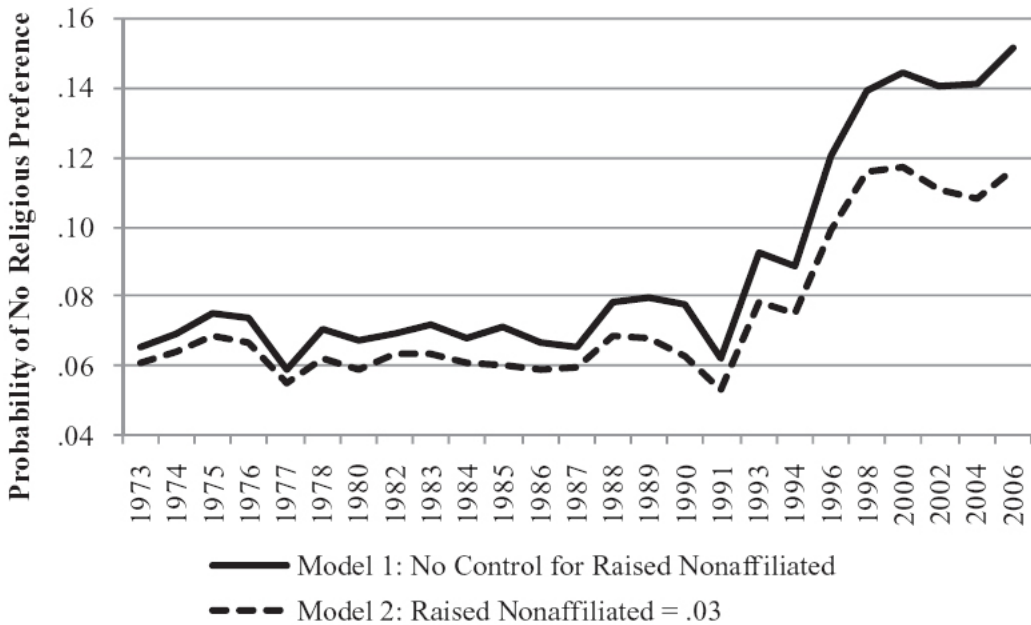
#### Age, Period, and Cohort Effects on Nonaffiliation and Disaffiliation

Age, period, and cohort effects from cross-classified, random-effects models and from intrinsic estimator models are presented in Figures 3 (age), 4 (period), and 5 (cohort). Separate models for all respondents and those raised with a religious preference are used to distinguish between nonaffiliation and disaffiliation. The period and cohort variance components from the cross-classified models are each large and significant, indicating meaningful variation in reporting no religious preference across both periods and cohorts.<sup>7</sup>

Figure 3 shows age effects from cross-classified and intrinsic estimator models. Regardless of analysis technique, there is a considerable decline in both nonaffiliation and disaffiliation as respondents grow older. Results from cross-classified models show a decline in nonaffiliation from a probability of almost 0.12 for 30-34-year-old respondents to a probability of less than 0.04 for those 75 years old or older. Although the probability of nonaffiliation among younger respondents is somewhat larger in the cross-classified results than in the intrinsic estimator results, the overall effects of age in the cross-classified models are similar to the effects of age in the intrinsic estimator models.

<sup>7</sup>Variance components from all respondents model: period = 0.168 and cohort = 0.011; variance components from raised with religion model: period = 0.126 and cohort = 0.026;  $p < 0.001$  for all variance components.

Figure 2. Probability of no religious preference by year, GSS 1973-2006

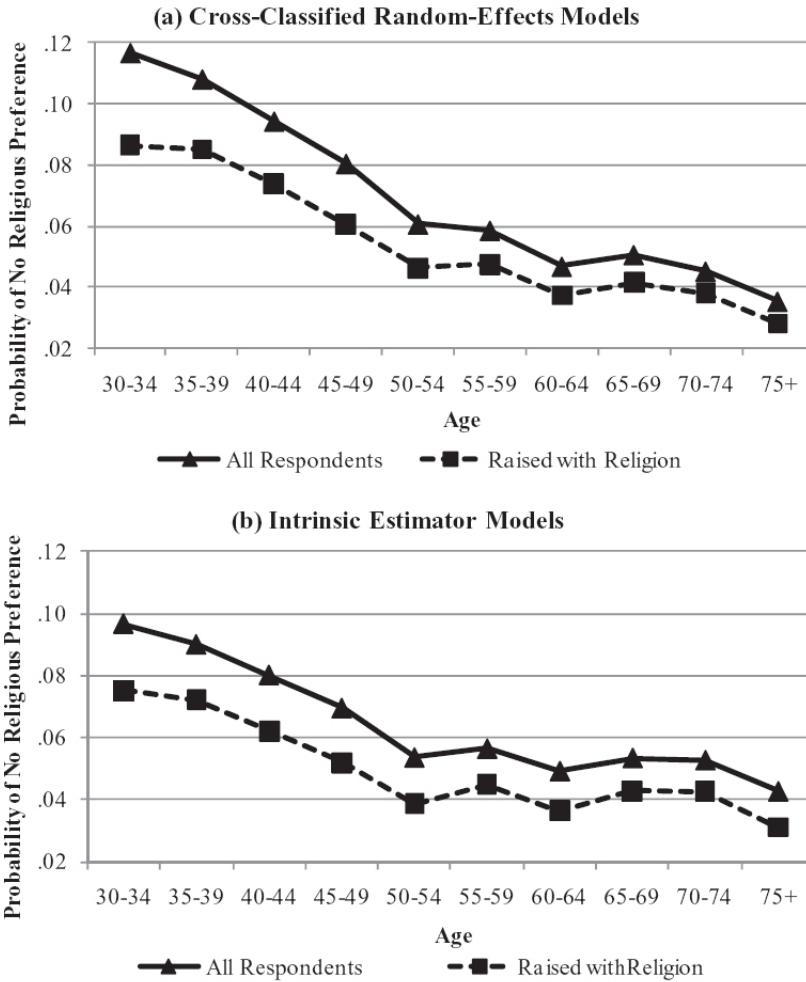


Note: Figure based on two binary logistic regression models of no religious preference;  $N = 45,116$ . Both models include dummy variables for each survey year as independent variables (1973 reference). Model 2 also includes control for raised nonaffiliated, which is set to 0.03. Model 1: 1974 through 1991 not significantly different from 1973, coefficients for 1993 and 1994 significant at 0.01, and coefficients for 1996 through 2006 significant at 0.001. Model 2: 1974 through 1994 not significantly different from 1973, coefficients for 1996 through 2006 significant at 0.001, and raised nonaffiliated significant at 0.001. Respondents born before 1890 or after 1984 deleted from sample; cases missing data on current religion or religion raised in deleted from sample.

Figure 4 graphs period effects on nonaffiliation and disaffiliation. The results show a considerable increase in the probability of nonaffiliation and disaffiliation in recent periods, specifically from 1990-1994 to 2000-2006. The intrinsic estimator and cross-classified models differ in estimated probabilities of reporting no religious preference in the earliest time period, which I address in further detail below. Regardless of the anomalous finding for the earliest period, both analysis techniques show a clear period-based increase in the likelihood of reporting no religious preference from 1990 to 2006.

The results reveal meaningful cohort effects on reporting no religious preference (Figure 5). The probabilities of both nonaffiliation and disaffiliation are considerably higher for the 1945 to 1959 cohorts than for preceding cohorts. While this across-cohort increase in reporting no religious preference is more pronounced in the intrinsic estimator models than in the cross-classified models, the pattern is evident in results from both types of models. As expected, Americans who matured in and around the 1960s are especially likely to report no religious preference. What is most interesting about the cohort findings, however, is the decline in disaffiliation for the last three cohorts compared to those born between 1945 and 1959. Both the intrinsic estimator and cross-classified results show that while the probability of nonaffiliation is relatively high for the 1965-1969 and 1970-1974 cohorts, the probability of disaffiliation is relatively low for those born between 1960 and 1974. There appears to be a return to the pre-1945 cohort level of disaffiliation among the youngest cohorts.

Figure 3. Age effects on no religious preference from Bernoulli cross-classified random-effects models and intrinsic estimator models, GSS 1973-2006

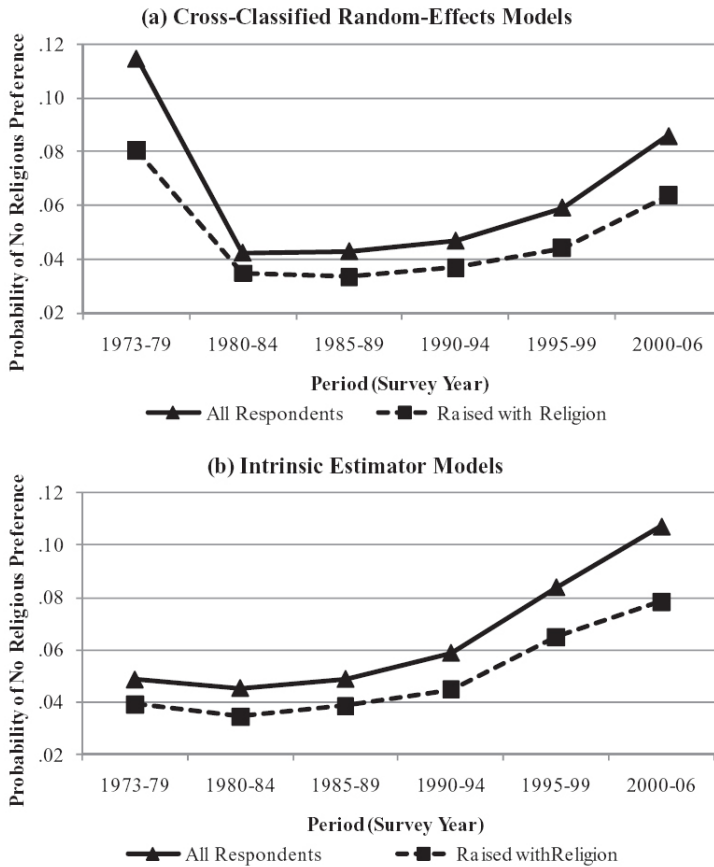


Note: Samples limited to respondents at least 30 years of age; all respondents  $N = 37,043$ ; raised with religion  $N = 33,976$ .

The two notable differences between the intrinsic estimator and cross-classified results are the relatively high estimated probabilities of reporting no religious preference in the earliest time period in the cross-classified models and the larger cohort effects in the intrinsic estimator models. While I cannot definitively say why the models differ in these ways, it is likely that these differences are related.<sup>8</sup>

<sup>8</sup>One possible reason for the anomalous results that I can rule out is that there are too few periods to properly estimate period effects in the cross-classified models. Cross-classified models using each survey year as a distinct period (i.e., 25 periods) also show a high estimated probability of reporting no religious preference in the earliest period (not shown). While the intrinsic estimator requires that period - age = cohort, cross-classified models do not require this linear dependency. Consequently, I was able to construct cross-classified models with 25 periods. For continuity, I use identical coding of age, period, and cohort in the cross-classified and intrinsic estimator models presented in this article.

Figure 4. Period effects on no religious preference from Bernoulli cross-classified random-effects models and intrinsic estimator models, GSS 1973-2006



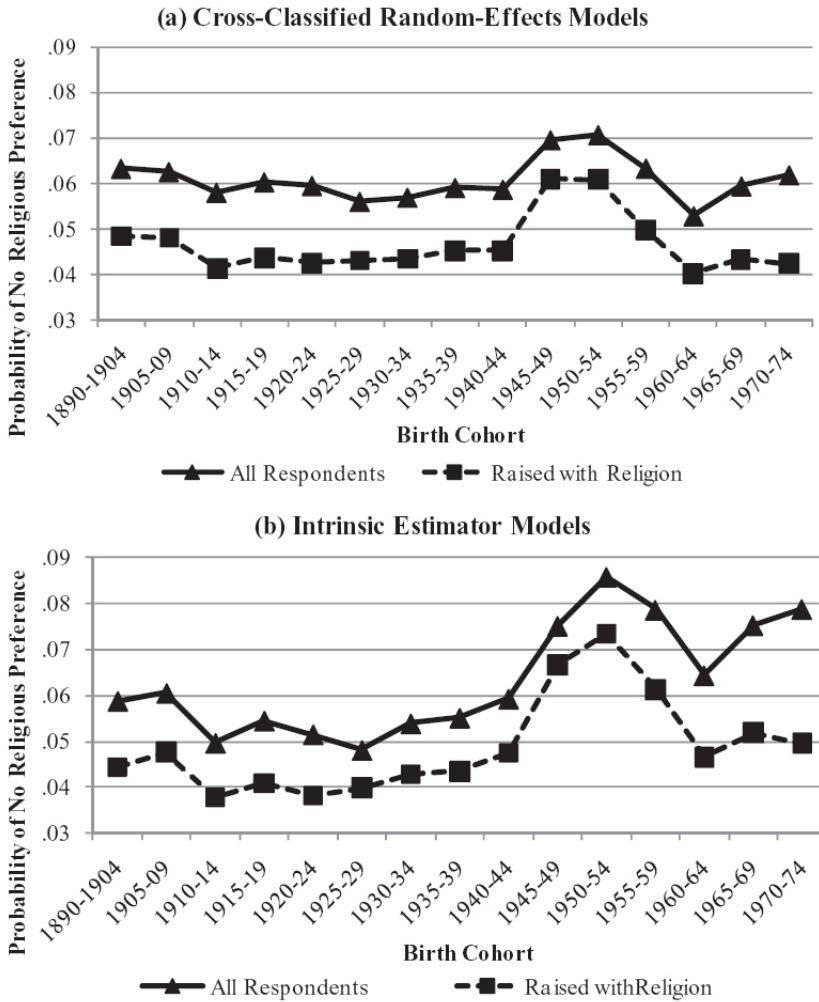
Note: Samples limited to respondents at least 30 years of age; all respondents  $N = 37,043$ ; raised with religion  $N = 33,976$ .

If there is a 1960s effect, then either all people should increase their likelihood of reporting no religious preference in the late 1960s and early 1970s (period effect) or those who matured in and around the 1960s should be especially likely to report no religious preference (cohort effect). Both analysis techniques appear to detect this 1960s effect but attribute it to different causes. The cross-classified models estimate a relatively high probability of reporting no religious preference in the 1970s, which is a period effect, while the intrinsic estimator models estimate larger cohort effects for those who matured in the 1960s. Although additional research is needed to understand these differences, the intrinsic estimator results are more congruent with theoretical expectations of a cohort effect for those maturing in the 1960s (Hout and Fischer 2002). Computer simulations also suggest that the intrinsic estimator results are more reliable since the intrinsic estimator is particularly unlikely to detect meaningful period effects when there are none.<sup>9</sup> Overall though, both analysis techniques show a period-based increase in reporting no religious preference from 1990 to 2006, across-cohort increases in reporting no religious preference for those born after 1944, and declines in disaffiliation for those born in the 1960s and 1970s compared to those born between 1945 and 1959.

<sup>9</sup>Yang et al. (2008) use simulated data with no period effects to show that intrinsic estimator models do not report period effects while other analysis techniques often detect meaningful period effects, particularly in the earliest and latest time periods.



Figure 5. Cohort effects on no religious preference from Bernoulli cross-classified random-effects models and intrinsic estimator models, GSS 1973-2006



Note: Samples limited to respondents at least 30 years of age; all respondents  $N = 37,043$ ; raised with religion  $N = 33,976$ .

**Conclusions**

To summarize, the results show that recent birth cohorts of Americans are far more likely than previous cohorts to be raised with no religious preference. Beginning with the 1955-1959 birth cohort, each cohort is more likely than the preceding cohort to report being raised with no religious preference. Additionally, the probability of nonaffiliation grew from between 0.06 and 0.08 in the 1970s and 1980s to almost 0.16 in 2006. Estimated growth in nonaffiliation, however, is notably smaller when being raised with no religious affiliation is constrained to 3 percent of respondents. These results suggest that a substantial proportion of the growth in nonaffiliation is due to more Americans being raised with no religious preference rather than solely being due to an increase in disaffiliation among adults. The age-period-cohort models demonstrate a clear period-based increase in nonaffiliation between

1990 and 2006. Where the results from the intrinsic estimator and cross-classified models differ, the intrinsic estimator results appear to be more congruent with theoretical expectations.

While Americans born in the 1960s and 1970s are disproportionately likely to report no religious preference, their probability of disaffiliating from religion is relatively low. The 1960 to 1975 cohorts are about as likely as the pre-1945 cohorts to disaffiliate. These youngest cohorts are relatively likely to be unaffiliated because they are disproportionately likely to be raised unaffiliated. It is possible that the strong, negative effect of age on disaffiliation will diminish in the 1960 to 1975 cohorts since they are still relatively young. As long as the effect of age remains relatively constant, however, the 1960s and 1970s cohorts should continue to be less likely than the 1945 to 1959 cohorts to disaffiliate from religion.

Period-based increases in nonaffiliation in the 1990s and the early part of this century combined with cohort replacement led to a sharp increase in reporting no religious preference from 1990 to 2006. The above results, however, suggest that as Americans born in the 1960s and 1970s grow older they will be less likely than those born in the 1940s and 1950s to disaffiliate from religion. Additional research is needed to estimate the impact of these cohort changes on the future of religious affiliation in the United States.

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