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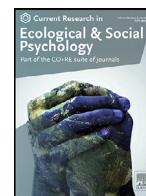
Selected anomalies or overlooked variability? Modernization is associated with secularization in countries with high historical wealth but is associated with increasing religiosity in post-communist or Christian-minority countries

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ABSTRACT

One prominent theory of social change predicts secularization—when societies prosper, people rely less on religion for ensuring survival, social order, and meaning of life. While some researchers claimed that secularization is universal, critics contended that it does not explain patterns of religious change in non-Western societies. To settle this debate, we applied multilevel modeling to analyze historical, socio-economic factors that moderated the process of secularization around the world. We predicted that secularization occurs as a result of modernization in societies where historical wealth and democratic institutions were established to ensure social, political, and ecological stability for citizens. We also used the cultural evolutionary account of religion to predict that modernization strengthens people's need for religiosity in societies without well-functioning institutions to mitigate increased social complexity. We used GDP and infant mortality as indices of modernization, the Gini index as an indicator of social complexity, and communist history (non-communist vs. post-communist) and the proportion of Christianity as historical contexts to explain variability in the within-society processes of secularization. Analyzing religiosity data with over 100 countries over 30 years, we found support for the secularization hypothesis primarily among formerly wealthy countries: in years when economic wealth increased, religiosity declined. However, an increase in GDP predicted increasing religiosity among formerly poor countries. We also found that increased economic inequality was linked with greater religiosity only among post-communist countries or Christian-minority countries: when economic inequality increased in those countries, religiosity increased. We integrate these findings and the present analytical approach to discuss implications for cross-cultural research and the study of cultural change.

1. Introduction

Human societies change. One of the most controversial debates about social change concerns whether the prominence of religion is disappearing in recent years—a phenomenon known as secularization (e.g., Froese, 2008; Stolz, 2020; Swatos and Christiano, 1999). One influential theory by Inglehart and Baker (2000) posited that religion wanes when people's living conditions improve through economic wealth. Although religion functions to ensure moral ethics, existential security, and meaning of life, fulfillment of these needs via economic development replaces religious beliefs with secular-rational values. While most Western societies follow this prediction, critics question whether secularization through modernization applies to non-Western societies (e.g., Berger, 1990; Stark and Finke, 2000). Does evidence against the secular-

ization hypothesis rely "too heavily on selected anomalies" (Norris and Inglehart, 2011)? Or did past research overlook systematic variability?

This article reconciles the inconsistent claims by addressing two outstanding limitations. The first limitation is the lack of an analysis of historical contexts that differentiate non-secular societies from secular societies. The cultural evolutionary theory of religion suggests that religion thrives when a society becomes modernized, as people experience greater needs for religion to maintain social, political, and ecological stability (Norenzayan et al., 2016). We reason that while many developing societies showed economic growth in recent years, the movement toward modernization may indeed increase religiosity, depending on historical contexts in which potential problems of modernization are handled. The cultural evolution of Western institutions suggests that Western modernization is rooted in the cultural evolution of individu-

alism, capitalism, and democracy (Henrich, 2020; Schultz et al., 2019). Once these institutions are established, modernization does promote secularization through (1) people's generalized trust to enable large-scale cooperation and (2) institutions effectively responding to the needs of the public and promoting existential security. In such societies, well-functioning institutions replace the role of religion in promoting existential security. Other societies without such history and institutions may struggle in promoting existential security despite stable economic growth.

Second, the ongoing debate regarding the secularization hypothesis lacks an analytical tool to integrate within-society processes with between-society processes. A within-society process refers to the longitudinal process that occurs within each local context over time; a between-society process refers to persistent differences across societies. Despite different implications derived from each level of analysis, it is typically at the between-society level where researchers provided evidence for the secularization hypothesis. A between-society analysis indicates that wealthy societies on average tend to be secular regardless of change over time, but it does not reveal how changing wealth accounts for the longitudinal variation in religiosity. Only when we integrate the within-society process with the between-society process, can we understand how historical contexts moderate the longitudinal process of secularization.

This article marries the cultural evolutionary theory of religion and western institutions with multilevel modeling of both within-country and between-country variation in religious change around the world. By doing so, we clarify previously unexplained variability in the process of secularization with the latest dataset by the World Values Survey, covering more than 100 countries over 30 years. We present evidence that (1) secularization only occurs among formerly wealthy societies, but (2) modernization is linked with increasing religiosity among formerly poor, post-communist, or Christian-minority countries. We then relate the present analytical approach to the broader literature on cultural change.

1.1. Modernization Theory

Modernization theory focuses on the function of religion as a cultural system that serves to relieve existential anxiety (Inglehart, 2021). The theory dovetails with other theoretical accounts that view religion as a shared meaning system expressed in symbols (Durkheim, 1915; Geertz, 1973), values (Cohen and Hill, 2007; Tarakeshwar et al., 2003), institutions (Batson et al., 1993), or practices (Koenig and Büssing, 2010). Consistent with the above treatments of religion, prior research has revealed that religiosity thrives when societies experience existential shocks like warfare, natural disasters, or economic downturns (Barber, 2011; Henrich et al., 2019; Storm, 2017; Sortheix et al., 2019).

It is this cultural nature of religion that is reactive to the consequence of modernization. Modernization constitutes economic development along with mass education, global capitalism, and public services, all of which improve existential security (Inglehart and Baker, 2000). When people acquire alternative means to secure survival, they begin to emphasize secular-rational values—individual autonomy and self-expression—as their guiding principles of life at the cost of religious beliefs. In this sense, greater individual freedom relegates religion to a less salient system for survival and fulfillment of life. Thus, modernization theory predicts that an increase in wealth (modernization) causes religiosity to decline.

Most of the evidence for modernization theory focuses on Western-European societies (e.g., Storm, 2017). Yet, another body of data implies that religiosity persists or even resurges in some societies even though economic wealth grows consistently around the world (Norris and Inglehart, 2011). But why do certain societies diverge from the proposed path of secularization despite the advent of modernization? Advocates of modernization theory acknowledge that the nature of secularization depends on historical factors (Norris and Inglehart, 2011). Yet the literature lacks sufficient explanations for diverse patterns of religious change, leading critics to contend: "What is needed is a body of theory to explain religious variation, to tell us when and why various aspects of religiousness rise and fall, or are stable. In that regard, the secularization theory is as useless as a hotel elevator that only goes down" (Stark and Finke, 2000, p. 78).

1.2. Cultural evolution of religion

The cultural evolutionary account of religion suggests that religiosity prevails when large-scale cooperation becomes a pressing issue due to increased political and economic complexity (Norenzayan et al., 2016). Rituals become important in achieving large-scale cooperation. Collective rituals tighten group bonds and strengthen the commitment to a transcending God(s), who ensures a peaceful afterlife and costly punishment (Shariff et al., 2016; Whitehouse et al., 2014). Thus, beliefs in God(s), supernatural agents, or the afterlife manage large-scale cooperation when a small-scale society experiences expansion of social networks (Whitehouse et al., 2014). Indeed, evidence for the cultural evolutionary account comes from pre-industrial societies showing that the presence of moralizing Gods correlates with characteristics of modernization—jurisdictional hierarchy, larger community size, abstract mode of money, and diverse economy (Johnson, 2005; Roes and Raymond, 2003; Underhill, 1975). The cultural evolutionary account of religion implies that modernization may bring about social, political, and economic complexity: these potential side effects, in turn, increase the need for religion. Focusing on the adaptive role of religion, this account contrasts with the modernization theory, which straightforwardly equates modernization with improved existential security.

1.3. Resurgence of religiosity in post-communist societies

The above evidence from the cultural evolutionary account of religion speaks to a potentially different mechanism by which modernization increases religion, but the literature on secularization is mute about resolving inconsistent evidence on various patterns of religious change observed in some societies. For instance, an ongoing debate revolves around post-communist societies, which experienced a resurgence of religion in the last few decades. Though Norris and Inglehart (2011) deem communism as an important historical factor that may moderate secularization, they refute alternative explanations by attesting to a birth-cohort analysis highlighting the decline in religious values among the young as opposed to the old in post-communist societies (which our analyses show is not appropriate evidence to support their claim). Moreover, the current debate attributes the lack of consensus to insufficient longitudinal data and the use of inappropriate methods. If anything, modernization theory predicts that secularization will eventually take place in post-communist societies *through the same mechanisms* that explain secularization in modernized societies.

But from the cultural evolutionary perspective of religion, modernization in post-communist societies may not have the same implication as predicted by the modernization theory. If religion thrives when societies go through political and economic complexity, the fall of communism might lead to the revival of religion. Communism once provided security similar to religion like providing meaning to people's lives (Inglehart et al., 2008). After its fall, complexity ensued among post-communist countries because of democratic transition, lost sense of security, and ideological differences among citizens. For example, some post-communists may have struggled to transition their way of life from communism to democracy and market economies, viewing this change as a hostile takeover (Opp, 2013). McFarland and colleagues (1992) found that Russian traditionalists still opposed laissez-faire individualism despite the economic collapse of the Soviet Union, whereas others from post-communist societies desired democratic reform to increase social freedom (Inglehart and Welzel, 2010). In cases like in Tajikistan, the end of communism led to a civil war, which was

influenced by regional, religious, and ideological differences that were suppressed under the communist rule (e.g., Whitlock, 2003).

A major driver of social complexity in post-communist societies is the concern for inequality. Though democracy is robust in tackling inequality (Lee, 2005; Muller, 1998), many of these post-communist countries have struggled with fiscal reform during the democratic transition, making it difficult for them to combat inequality (Gerry and Michiewicz, 2008). Moreover, the issue of inequality is also met with a stark generational divide on the acceptable levels of inequality in post-communist societies. People socialized under communism were more sensitive to income inequality compared to those socialized under democracy (Ignácz, 2018). The former follows an "ethos of equality" whereas the latter shares values seen in the Western world. Consequently, those who were socialized under communism trusted institutions less and were dissatisfied with democracy when their countries experienced high levels of inequality whereas others were unaffected by inequality (Jami and Kemmelmeier, 2021).

We posit that modernization threatens social order, rather than ensuring existential security in post-communist societies, Indeed, the post-communist transition to democracy and market economies brought about increased social complexity such as ideological differences, increased economic inequality, and psychological hardship. This possibility suggests that modernization influences religious change in post-communist societies *for different mechanisms* than predicted by modernization theory.

1.4. The Role of Institutions in the Path to Secularization

What makes secular societies different from non-secular societies? Henrich (2020) attributes the origin of WEIRD (Western, Educated, Industrialized, Rich, and Democratic) societies to the emergence of non-kin-based organizations, which led to the historical advantage of economic prosperity and democratization. Western modernization originates from the medieval era when the Roman Catholic Church banned the marriage of close relatives. This change encouraged people to expand their social networks and create institutions around generalized trust and involuntary cooperation. These higher-level institutions were not unique to Western societies: many prosperous Asian countries had also adopted the Western models of economy and democracy. Indeed, societies characterized with loose kinship tend to exhibit norms of generalized trust, individualism, and impersonal prosociality (Schultz et al., 2019). The collection of these social norms and psychological characteristics provided easy pathways to Western institutions like capitalistic markets and democratic governments (Henrich, 2020).

The cultural evolution of Western institutions influenced secularization in two notable ways. First, the emergence of capitalism and democratic institutions implies that people increasingly rely on individual freedom and generalized trust when interacting with strangers, going beyond their kin-based networks (Hruschka and Henrich, 2013). Democratic institutions and norms of generalized trust assist with large-scale cooperation: safe interactions among strangers are made possible by the norm of generalized moral codes and involuntary cooperation. Once such norms are established, people do not have to rely on religion to maintain large-scale cooperation and social order.

Second, Western institutions promote secularization through the effective use of resources to address existential security and social complexity. Research has shown that democratic governments with a legacy of economic resources are better able to combat ecological threats (e.g., natural disasters, pathogens) and inequality than autocratic governments because bureaucracies are more responsive to the needs of citizens (Besley and Burgess, 2002; Thelen, 1999; Lin, 2015; Lee, 2005). Once democracy is long-established, it promotes the collective welfare of citizens, even when modernization brings about threats such as greater economic inequality. The aforementioned function of long-established democracy is in sharp contrast with young democracies (and autocracies) in post-communist societies that may have not institutional-

ized public accountability to manage growing inequality resulting from modernization (e.g., see Fig. 5 in Results).

We argue that secularization may be unique to societies with the historical advantage of wealth or well-functioning, democratic institutions, whereas other developing societies or non-democratic countries have not yet established effective means to replace the adaptive role of religion. These differences may manifest in a long-standing historical context dating back to the emergence of Western institutions. Religiosity thrives when formal institutions do not provide citizens with systematic means to guarantee safety in response to modernization. In such societies, religion functions to assist large-scale cooperation and social order, and this tendency may be particularly prevalent in post-communist societies.[1]

1.5. Taking time seriously: Multilevel modeling of religious change across societies

Much of the confusion around the secularization hypothesis also originates from inappropriate methods to test different predictions about secularization. Specifically, extant evidence cannot explain variability in secularization due to the neglect to realize nested/clustered data that involve the longitudinal variation of religious change as well as the between-society variation in levels of religiosity. Most studies relied on cross-sectional comparisons on the relationship between wealth and religiosity, but hardly demonstrated how *changing* wealth was linked with *changing* religiosity.[2] Since a cross-sectional analysis ignores any longitudinal variation by pooling or aggregating data, between-society comparisons only attest to the historical process: wealthy societies are less religious than poor societies *regardless of change over time*. What should be done is an explicit analysis of the within-society variation. Since both types of processes are often confused, current evidence cannot explain how the secularization hypothesis holds at the within-society level of analysis.

The first step to resolve this limitation is to conceptualize data as comprising multiple levels. Typically, secularization is analyzed by international panel datasets which involve a multilevel process (see Fig. 1). Respondents are nested within years, which are nested within countries. Respondents (level 1) represent the lowest-level unit of analysis, enabling individual-level comparisons like a birth cohort analysis. Country-year (level 2) comprises responses of respondents aggregated across each survey year, enabling longitudinal comparisons that can attest to changes in religiosity and directly test modernization theory. Finally, country (level 3) represents the highest-level unit of analysis that aggregates all respondent-level and country-year-level data, enabling between-country comparisons.

Even when researchers analyze nested/clustered data, they often conflate the within-society variation with the between-society variation by pooling or aggregating longitudinal data (e.g., McCleary and Barro, 2006; see Table A1 in the Appendix). Unfortunately, those cross-sectional analyses have potentially generated an erroneous interpretation of the observed findings. Typical cross-sectional evidence that wealthy societies tend to be secular tells us nothing about the within-society processes, whether it is a birth cohort comparison (inter-individual process) or a longitudinal comparison (societal-level change in wealth and religiosity). The within-country relationship between wealth and religiosity may be positive, negative, or null regardless of the observed patterns at the cross-sectional level (see Fig. 2 for illustra-

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[1] We do not suggest that Western institutions are superior in any way, nor that religion is inferior in any way. We simply point out different historical trajectories that different societies underwent.

[2] Table A1 in the Online Appendix provides a summary of representative publications that empirically tested the link between wealth and secularization based on international databases since the seminal work by Inglehart and Baker (2000). The majority of previous research applied OLS regressions or fixed-effects regressions to their international panel data.
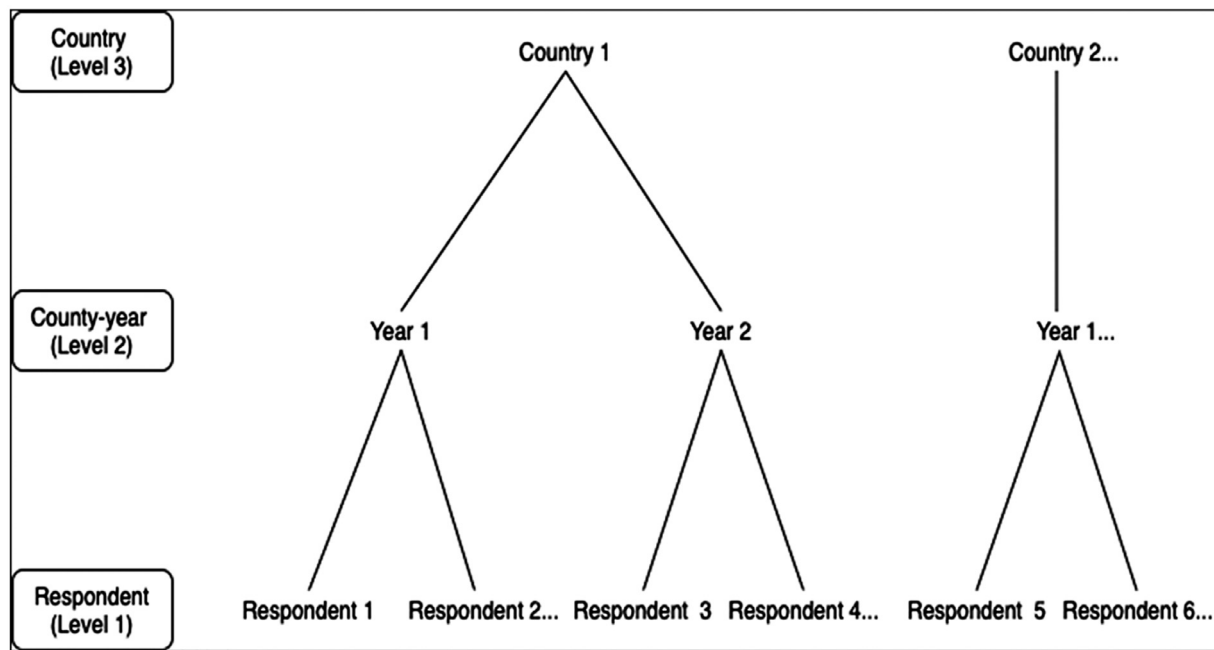
Fig. 1. Nested/clustered structure of international panel data typically used to demonstrate secularization

tion of "cluster confounding," Bartels, 2008; also see Grotenhuis et al., 2015). For example, Norris and Inglehart (2011) found a positive relationship between age and religious beliefs in post-communist countries and used this evidence to support the secularization hypothesis. However, such an individual-level analysis does not prove that some societies will secularize over time; indeed, younger cohorts may become more religious over time. A longitudinal inference about the process of cultural change should be analyzed by time-varying variables attesting to a within-society comparison of change over time. Various tutorials discuss the importance of distinguishing levels of analysis in clustered/nested data (e.g., Bryk and Raudenbush, 1992; Snijders and Bosker, 2011; Rabe-Hesketh and Skrondal, 2012; Curran and Bauer, 2011).

Some research acknowledged the limitation of cross-sectional data in assessing the secularization hypothesis (e.g., Grotenhuis et al., 2015) and sometimes used longitudinal data to support or debunk modernization theory (e.g., Finke and Iannaccone, 1993). However, none of the previous studies on secularization integrated within-society processes with between-society processes to form a unified analytical framework. We offer a multilevel framework to fill in this gap. Once we separate the within-society process from the between-society process (Fig. 1), we begin to understand the within-country process of secularization, and more importantly, how the longitudinal association between modernization and religiosity varies across societies. In other words, multilevel modeling of international panel data allows us to examine how the observed longitudinal relationship at the country-year level (level 2 in Fig. 1) varies as a function of historical characteristics observed at the country level (level 3 in Fig. 1).

1.6. Study overview

We aim to resolve inconsistent claims about the secularization hypothesis by applying a multilevel framework to the relationship between modernization and religiosity. We test several predictions derived from modernization theory and the cultural evolutionary account of religion.

Prediction 1. In times when a country experiences aspects of modernization (economic growth, lower mortality), the level of religiosity decreases.

Prediction 2. In times when a country experiences increased social complexity (inequality), the level of religiosity increases.

Prediction 3. Wealthy countries on average tend to show lower levels of religiosity.

Prediction 4. Countries with greater social complexity (inequality) on average tend to show higher levels of religiosity. Note that these predictions do not overlap with each other. Prediction 1 and 2 are tested by the analysis of within-country variation. However, Prediction 3 and 4 require an analysis of between-country variation. A multilevel analysis allows us to test these predictions simultaneously without confusing them. We further clarify previously unexplained variability in the observed relationship between modernization and religiosity by distinguishing historical variation from contemporary variation in religious change. Based on the cultural evolutionary account of religion, we predict that religiosity prevails as a response to modernization among developing societies, especially among post-communist societies without institutional resources to handle complex social change. Those potential differences in historical variables will manifest as persistent between-country differences at the highest level in our multilevel framework (level 3 in Fig. 1). Since longitudinal variation is aggregated at this level, between-country variation represents different paces at which societies underwent the cultural evolution of Western institutions or how a country's religious trajectory was moderated by countries' (non) communist history. Within the present multilevel framework, we examine how historical variables at level 3 moderate the process of secularization observed at level 2.

Prediction 5. Change in aspects of modernization (economic growth, lower mortality) is associated with decreasing religiosity among formerly wealthy, democratic countries. But this pattern is reversed among historically developing, post-communist countries such that modernization is positively associated with changing religiosity.

Prediction 6. Increasing social complexity (inequality) is associated with increasing religiosity. But this pattern is more prevalent in historically developing, post-communist countries than in formerly wealthy, democratic countries.
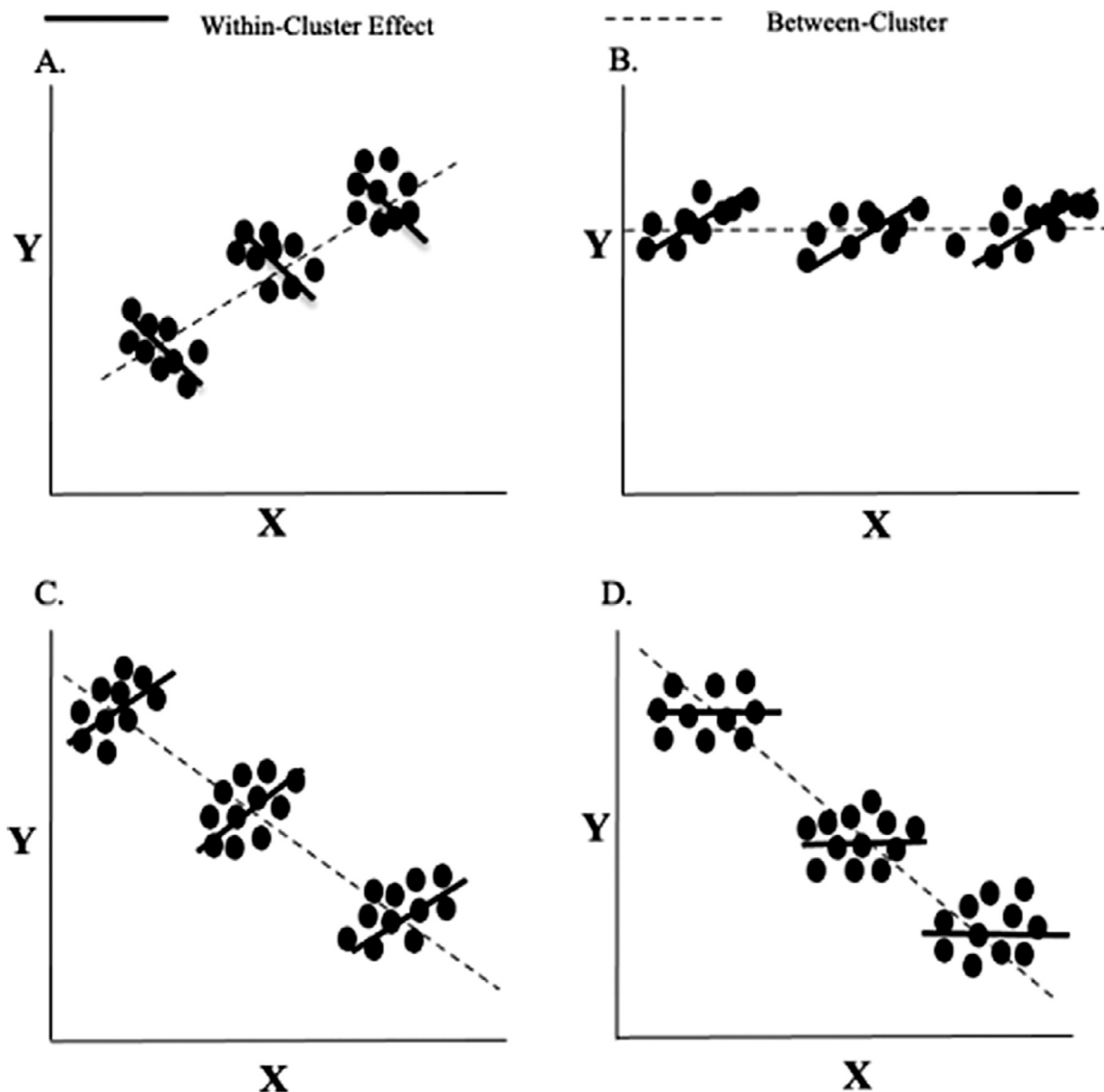
Fig. 2. An illustration of cluster confounding

Note. (A). The cross-sectional (between-cluster) relationship is positive, but the within-cluster (a cohort comparison or a longitudinal comparison) relationship is negative. (B). The cross-sectional relationship is null, but the within-cluster relationship is positive. (C). The cross-sectional relationship is negative, but the within-cluster relationship is positive. (D). The cross-sectional relationship is negative, but the within-cluster relationship is null.

2. Method

We combined the World Values Survey (WVS, 1981-2020, Inglehart et al., 2020) and European Values Survey (European Values Survey 2020) to create a comprehensive time-series cross-sectional (TSCS) dataset on religiosity. The WVS/EVS data covers survey items central to religiosity across all waves: (1) confidence in church, (2) attendance in religious services, (3) religious identity, and (4) importance of God (see Koenig and Büssing, 2010; Norris and Inglehart, 2011; Saucier et al., 2015). After merging the two datasets, we assigned each country an official label using the R-package, "countrycode" (Arel-Bundock et al., 2018). We separated countries that are geographically similar yet distinct in religious doctrines (e.g., Bosnia and Herzegovina, and Serbia). Our data management yielded an initial set of 107 countries and enabled us to add other country-level variables such as GDP per capita. While the most recent WVS data were released in 2020 for Ethiopia, Guatemala, and Iran, we re-coded the year for these countries to be 2019 so that they are compatible with other country-level data collected before 2020. Overall, our TSCS dataset contains

a mean of 3.65 ($SD = 2.08$, $Min = 1.00$, and $Max = 9.00$) assessment waves for each country. Between 1981 and 2019, survey years for each country were separated by 6.46 years on average ($SD = 3.11$, $Min = 1.00$, $Max = 17.00$). We made our statistical codes available in R, and additional summaries and analyses concerning our methodology are available at our Open Science Framework repository (https://osf.io/5n4mr/?view_only=05ca69cc6dae4f81af007b2e5e1ee4b5).

2.1. The global index of religiosity

We used four items in the WVS/EVS to create the global index of religiosity: confidence in church (E069_01), attendance in religious services (F028), religious identity (F034), and importance of God (F063). Respondents missing any of these items were excluded before analysis. We then computed the average of these items to create the global index of religiosity (1 = *low religiosity*; 100 = *high religiosity*).

Confidence in church. The item read: "Please look at this card and tell me, for each item listed, how much confidence you have in them (*The church*), is it a great deal, quite a lot, not very much or none at all?

1 = *A great deal;* 2 = *Quite a lot;* 3 = *Not very much;* 4 = *Not at all.*" This item was reverse-coded.

Attendance in religious services. The item read: "Apart from weddings, funerals and baptisms, about how often do you attend religious services these days? 1 = *More than once a week*; 2 = *Once a week*; 3 = *Once a month*; 4 = *Christmas/Easter day*; 5 = *Other specific holy days*; 6 = Once a year; 7 = Less often; 8 = Never, practically never." We combined scales 4 and 5 since they are indistinguishable from each other, and most countries were missing the scale 5.[3] This item was reverse-coded.

Religious identity. The item read: "Independently of whether you go to church or not, would you say you are: 1 = *A religious person*; 2 = *Not a religious person*; 3 = *A convinced atheist.*" This item was reverse-coded.

Importance of God. The item read: "How important is God in your life? 1 = *Not at all*; 10 = *Very*."

2.1.1. Measurement invariance

A cross-cultural assessment of survey items poses serious threats to the interpretation of data if items are not equivalent across societies. In our data, the global index of religiosity may not be comparable due to several reasons. For instance, any temporal changes observed in data may be due to idiosyncratic responses caused by unidentified factors in specific survey administration. Moreover, there are potential differences in the appropriateness of attendance in religious services. For instance, being a member in good standing in many Evangelical Christian groups would imply "more than once a week," whereas "once a week" may imply high attendance for a Catholic, and regular attendance is not a requirement at all for certain religious groups. To examine scale comparability across all the countries in the present research, we conducted measurement invariance testing with the *Lavaan* package in R (Rosseel, 2012). We examined the scale with all four items and obtained reasonable configural and metric invariances. Thus, the global index of religiosity is comparable across cultural groups at two levels of invariance. The global average of alpha reliability was .69 (*Mdn* = .77; *SD* = 0.19). Table A4 in the Appendix provides more details and explanations.

2.1.2. Anomaly in data

To detect anomalies in the original data and the scale property other than scale comparability, we inspected alpha reliabilities of the religiosity index and frequency distributions of each item for each country-year observation. We fixed coding errors in Australia in 2018 (F028) and Kyrgyzstan in 2011 (E069_01) by reverse-coding some items of the original scale. Still, several countries showed poor scale reliabilities and unusual distributions: we excluded five country-year observations that had negative alpha reliabilities (Bangladesh 2018, Egypt 2018, Jordan 2014, Libya 2014, and Pakistan 2012).[4] Throughout the present we report results that include all country-year observations whose alpha reliability was greater than zero.

2.2. Individual-level variables

To maintain good coverage of TSCS data, we were constrained by the number of individual-level variables that were available across all waves of WVS/EVS. This limitation left us with sex (X001, 0 = male, 1 = female), age (X003, centered at age 30), and subjective well-being (A008, Feeling of happiness; A170, Life-satisfaction; both group-mean centered at the country-year level). Although we sought to retain other survey items akin to traditional vs. secular-rational values and survival vs. self-expression values (Inglehart and Baker, 2000), these items were

not as complete as the religiosity items. We, therefore, excluded incomplete individual-level items to maximize the breadth of the religiosity items.

2.2.1. Selection of country-level variables

To explain within-country variance and between-country variance, our analysis required as many longitudinal observations and countries as possible. Thus, priority in our variable selection for country-level data was constrained by four criteria: (1) coverage of countries; (2) the extent to which variables were longitudinally available from 1981 to the present; (3) evidence of reasonable within-country variation relative to between-country variation; and (4) evidence of previous use in the literature of secularization. Importantly, country-level variables serve as time-varying variables at the country-year level (level-2) as well as time-*in*varying variables at the country level after aggregation (level-3). We are aware of potential covariates that should be included in our analysis: variants of the secularization hypothesis proposed other relevant variables associated with modernization such as educational attainment, urbanization, or country-level freedom values; many variables have been proposed as indicators of WEIRD societies in line with Henrich's theory (2020); variables such as population density, climate, and natural disasters may serve as indicators of ecological threats. Yet these variables did not meet the above criteria (we do consider alternative models in the Results section and the Appendix). Therefore, we deemed GDP per capita, infant mortality rate, and economic inequality (the Gini index) as the most relevant measures of modernization.

2.2.2. GDP per capita

We considered economic wealth as a material aspect of modernization. We obtained the latest data from the World Bank for country GDP per capita (in current US dollar). Economic wealth is the most widely used indicator of modernization (Inglehart and Baker, 2000)and the most widely available across countries and years while showing high convergence with other relevant indicators of modernization such as emancipation values (Welzel, 2013). Because some countries were missing GDP values for the most recent years of our WVS/EVS data (2019, 2020), we imputed those missing values of GDP per capita by either taking values of the latest year recorded in WVS/EVS or consulting external sources. We used the United Nations database to impute missing GDP values for Hungary in 1982 and Montenegro in 1996. We also consulted the International Monetary Fund (2020) to impute missing GDP for Taiwan in 1994, 2006, and 2012. We log-transformed GDP per capita (GDP hereafter) before analysis to meet the linearity assumption.

2.2.3. Infant mortality rate

We obtained the infant mortality rate from the World Bank (1981-2018). Although economic wealth taps into economic means to promote survival and individual freedom, a more direct indicator of modernization may be to measure the degree of existential security: a *lower* infant mortality rate represents a *safer* environment. Although researchers have used various indicators of existential security in the study of secularization (e.g., life expectancy), we deemed the infant mortality rate a more appropriate measure of existential security for the present purpose because (1) it measures threats in one's immediate surroundings; and (2) it is the most comprehensively available and compatible with our TSCS data with sufficient within-country variability. We imputed missing values of the infant mortality rate for 2018, 2019, and 2020 by either taking values of the latest year recorded in WVS/EVS or consulting external sources. We relied on Macrotrend (2020) to impute the infant mortality rate for Hong Kong in 2014 and 2018 and Taiwan in 1994, 2006, and 2012, and on Eurostat (2021) to impute a missing value for Kosovo in 2008. To avoid multicollinearity between infant mortality and GDP (*r* = -.80), we did not include them in the same model but rather used the infant mortality rate as a conceptual replication of the effect of GDP in a separate model.

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[3] This problem may have to do with Islamic or Buddhist countries that do not recognize Easter. Combining the scale points 4 and 5 makes sense given their comparability in the frequency of behavior and the lack of documentation in WVS/EVS.

[4] These cases may have contained coding errors, but we could not detect clear sources of the problem. So we exclude them in the present analyses.

Table 1

Communist countries included in the present World Values Survey

	Countries	N
Current		
	China, Vietnam	2
Former		
	Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Ukraine, Uzbekistan, Yemen, Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Albania, Bosnia and Herzegovina, Bulgaria, Macedonia, Croatia, Montenegro, Serbia, Slovenia, Ethiopia	29

Source: https://www.infoplease.com/world/diplomacy/communist-countries-past-and-present

2.2.4. The Gini index (economic inequality)

We used the Gini index as a country-level proxy for social complexity, as was operationalized in previous research (Norris and Inglehart, 2011). Research indicates that inequality can induce an "equilibrium rupture"—which causes people to lose stability and predictability of their life course, causing anxiety and uncertainty, and novel scenarios such as heightened poverty risks (Esping-Andersen and Nedoluzhko, 2017). Thus, the Gini, for it is a measure of inequality, can be used as a proxy for social complexity. In the present analysis, we obtained the Gini index from the Standardized World Income Inequality Database version 9.1 (SWIID; Solt, 2020). This index represents income distributions within countries, with a higher value indicating a greater income disparity. This dataset has advantages over other sources of income inequality, as it is cross-validated and contains greater coverage than other sources, spanning over 190 countries or territories since the year 1960. Among several indices of Gini available in the SWIID, we analyzed the Gini of disposable (post-tax, post-transfer) income, as it is the most frequently used index. The SWIID Gini index (hereafter, Gini) has high convergence with that of the World Bank, $r = 0.90$ ($n = 162$).

2.2.5. Communist regime

We classified 31 countries as current-communist or post-communist based on Infoplease (https://www.infoplease.com/world/diplomacy/communist-countries-past-and-present). See Table 1 for the list of all communist countries. We then created a post-communist dummy variable (0 = Non-communist; 1 = Post-communist).

2.2.6. The proportion of Christianity

To consider potential differences in secularization shaped by different religious affiliations (i.e., WEIRD history), we obtained the country-level proportion of the Christian population from the World Population Review (2021). Since this variable was only available at one point in time, we used this as a country-level time-invariant indicator of Christianity. We assume that the proportion of Christianity is stable over time and represents historical differences in Christianity.

2.3. Analytic strategy

We draw on the so-called "within-between random-effects regression" to analyze the multilevel processes of religiosity in our TSCS data (Bell and Jones, 2015; Rabe-Hesketh and Skrondal, 2012; Curran and Bauer, 2011). We begin by fitting a null model without any predictors to confirm the three-level structure of our data as depicted in Fig. 1:

$$Religiosity_{ijk} = \beta_0 + v_k + u_{jk} + e_{ijk}$$
$$v_k \sim N(0,\ \sigma_v^2), u_{jk} \sim N(0,\ \sigma_u^2), e_{ijk} \sim N(0,\ \sigma_e^2) \quad (1)$$

where β_0 is the estimated overall mean of religiosity, and observations come from ith respondent from year j, which is nested within country k. Eq. (1) decomposes residual variance into three levels: the respondent-level (e_{ijk}), the country-year level (u_{jk}), and the country-level (v_k). Our three-level model improves upon simpler models that ignore the multilevel structure of our data (see Table A2 in Appendix for model compar-

isons). Overall, the present model justifies our attempt to model variance of religiosity as illustrated in Fig. 1. [5]

We then extend the Eq. (1) to the following general model:

$$Religiosity_{ijk} = \beta_0 + \beta_1 x_{ijk} + \beta_2 Year_{jk} + \beta_3 (x_{jk} - \overline{x_k}) + \beta_4 \overline{x_k}$$
$$+ \beta_5 (x_{jk} - \overline{x_k}) \cdot \overline{x_k} + [v_{0k} + v_{1k}(x_{jk} - \overline{x_k})] + u_{jk} + e_{ijk}$$
$$\begin{bmatrix} v_{0k} \\ v_{1k} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_{v0}^2 & \\ & \sigma_{v1}^2 \end{bmatrix}\right), u_{jk} \sim N(0, \sigma_u^2), e_{ijk} \sim N(0, \sigma_e^2) \quad (2)$$

The coefficient β_1 estimates the effect of individual-level variable x, which is measured across respondent ijk. β_2 estimates the fixed effect of a linear trajectory of religiosity and ensures that substantive estimates of our within-country variables are not merely due to a linear trend common to all time-varying variables (Fairbrother, 2014). The key feature of this model is the separation of within-country effects and between-country effects. The coefficient β_3 estimates the within-country effect, expressed as $(x_{jk} - \overline{x_k})$. This is equivalent to group-mean centering, as each raw variable is subtracted from its country-specific mean, $\overline{x_k}$. This procedure enables time-varying predictors to have means of zero and thereby eliminates any between-country variability inherent in the raw time-varying predictor, x_{jk}. This procedure, in turn, allows us to estimate the between-country effect by β_4 (as well as other country-level covariates), independently of within-country effects. If the raw variable, x_{jk}, was not centered this way, β_3 would contaminate two independent processes—within-country and between-country processes—that should be modeled separately. Since the within-country and between-country predictors are separated, both effects can be estimated simultaneously without the problems of correlated covariates and residuals (Bell and Jones, 2015).

Since within-country (time-varying) variables are unrelated to between-country (time-*in*varying) variables, we can multiply these variables to create cross-level interaction terms as $(x_{jk} - \overline{x_k}) \cdot \overline{x_k}$. Therefore, β_5 clarifies the extent to which the within-country effect, $(x_{jk} - \overline{x_k})$, varies as a function of the between-country effect, $\overline{x_k}$. A substantive question in the present analysis is to what extent the within-country effects of time-varying variables (GDP, Gini, and infant mortality rate) on religiosity depend on the persistent differences in the level of time-*in*varying variables (country-specific averages of GDP, Gini, infant mortality rate, and the post-communist dummy and the proportion of Christianity) across countries. In short, the random-effects regression model serves better than other regression approaches for the present purpose of explaining variability associated with the within-country (longitudinal) relationships. We also include random slopes of within-country effects involved

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[5] We also considered the possibility that countries are not independent of each other—a well-known problem called the "Galton's problem (Dow & Eff, 2008). Following the previous recommendation for handling interdependence of counties within the multilevel framework (see Kusano & Kemmelmeier, 2018; Kuppens & Pollet, 2014), we included a region-level intercept to the present models. Indeed, the four-level model did improve upon the three-level model. However, the implications of the reported coefficients remained identical—if anything with greater clarity. Therefore, we do not present four-level models for ease of interpretation. Interested readers may refer to the Appendix for more details.

Table 2

Country-level descriptive statistics (1981-2019)

Variable	N	Mean	SD	Mdn	Min	Max	Skew	Kurtosis	Level	Source
Global Index of Religiosity	106	70.75	13.87	71.9	33.13	93.71	-0.37	-0.74	Country/Country-Year	WVS/EVS
GDP per capita (in current US dollar)	105	13947	16940	6302.15	239.47	88290	1.82	3.39	Country/Country-Year	World Bank
Infant mortality rate (per 1,000 infant births)	105	20.86	21.84	12.62	1.33	108.41	1.81	2.98	Country/Country-Year	World Bank
The SWIID Gini index	100	36.14	8.14	33.99	23.15	62.22	0.51	-0.18	Country/Country-Year	SWIID version 9.1
The proportion of Christianity (in percentage)	105	54.03	35.13	65	0.2	98	-0.44	-1.42	Country	World Population Review
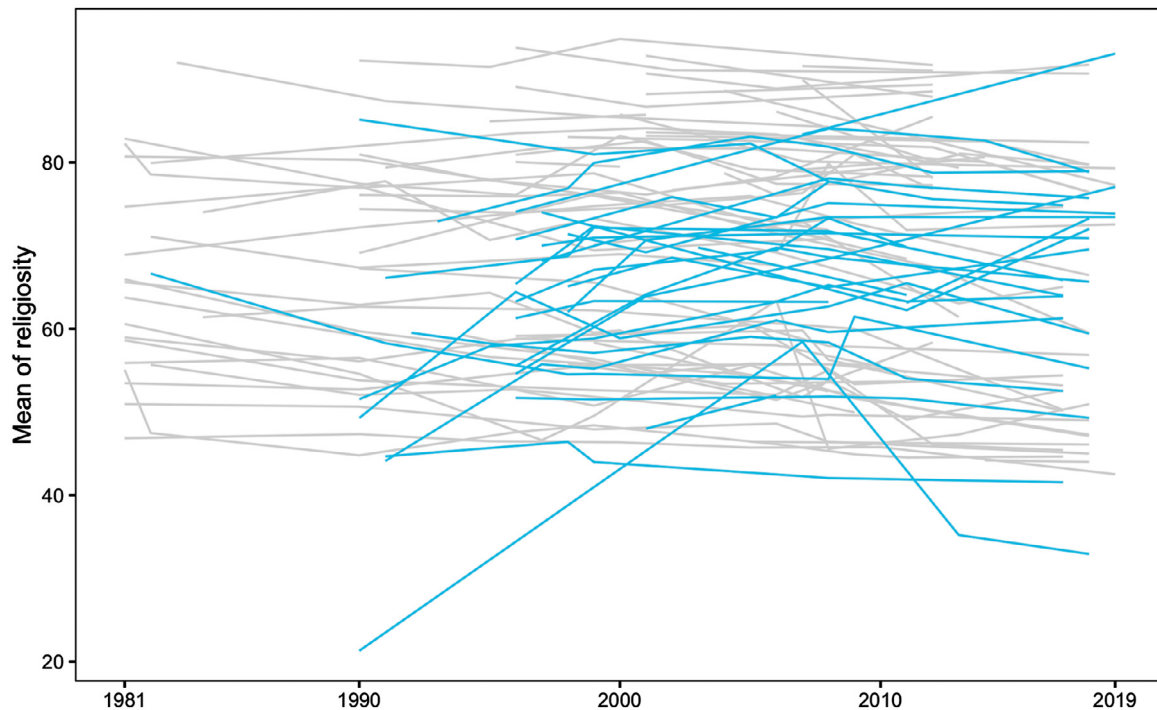
Fig. 3. Country-specific trajectories of religious change (n = 86, 1981-2019)
Note. Green lines represent post-communist countries

Table 3

Country-level correlations

	Variable	1	2	3	4
1	Global Index of Religiosity				
2	GDP per capita (log)	-.66			
3	Infant mortality rate	.65	-.80		
4	The SWIID Gini index	.58	-.51	.50	
5	The proportion of Christianity	-.01	.16	-.16	.03

Note. All correlation coefficients were computed by pairwise deletion.

in cross-level interactions, as failure to do so produces liberal statistical inferences (Heisig and Schaeffer, 2019).[6]

3. Results

3.1. Descriptive statistics and preliminary analyses

Table 2 summarizes descriptive statistics of all country-level (level-3) variables used in the present analyses. Table 3 provides country-level correlations between the variables. The Appendix provides figures for in-

dividual trajectories of secularization for each country along with more detailed descriptive statistics and models with alternative covariates.

We conducted three preliminary analyses to get initial insights into historical differences and trajectories of religiosity and modernization between post-communist countries and non-communist countries (See the Appendix for detailed R codes and results). Fig. 3 depicts country-specific trajectories of religiosity over time. What is immediately clear is the substantial variability in the trajectory of religious change: many countries show a clear sign of secularization, while many countries show increasing trends of religiosity. Fig. 4 shows that of the 88 countries that have at least two observations, more than one-third (*n* = 31) showed an overall growth in the mean levels of religiosity between 1981 and 2019, and most of the countries with increasing religiosity are post-communist. For example, China, Montenegro, and Bulgaria showed the highest growth rates, 54.69%, 41.14%, and 38.91%, respectively. These growth rates of religiosity in the absolute magnitude surpass those of the top three secular countries: Australia (-26.11%), Belgium (-24.23%), and the Netherlands (-22.53%). This preliminary analysis already highlights that the claimed universality of secularization is far-fetched and illuminates unique patterns of religious change in post-communist countries.

We also found systematic variability in the rates of economic growth between non-communist countries and post-communist countries. The between-country comparison showed that GDP in post-communist countries was 0.70 lower than that in non-communist countries, *t*(104) = -2.47, *p* = .01. We then built a societal growth curve model to estimate the trajectory of GDP over time (Fairbrother, 2014). Regressing the Year

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[6] Note that we excluded a random-slope of Year to avoid computational difficulty; the model included a random-slope of year in addition to random-slopes of other level-2 variables, which failed to converge in R. For a similar reason, our residual covariance is unstructured.
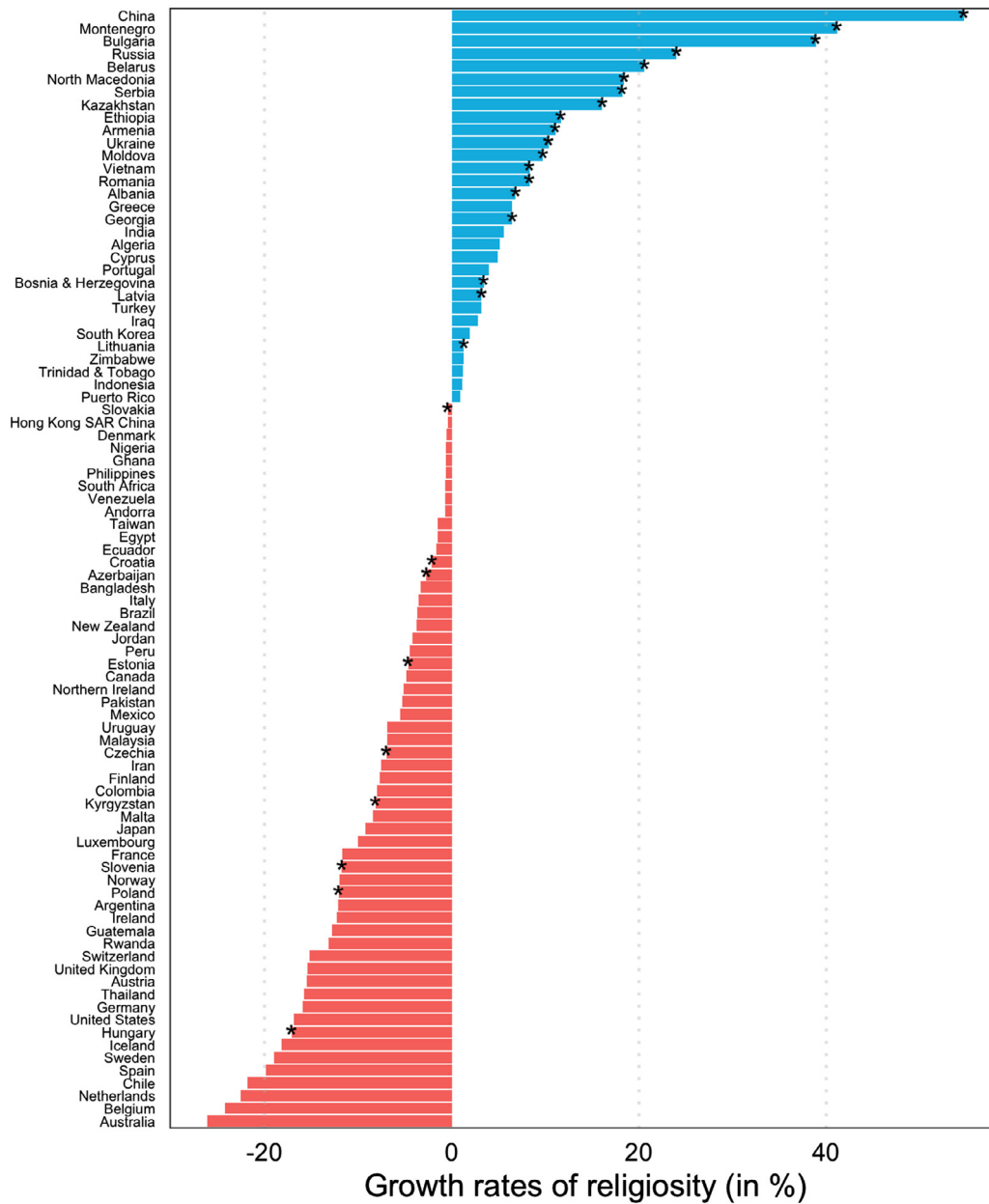
Fig. 4. Growth rates of religious change of each country from 1981 to present
Note. Growth rate is based on calculation between the earliest year and the latest year available for each country. Asterisks represent post-communist countries. Twenty-one countries were excluded in this graph because they had only one assessment wave; three of them were post-communist (Kosovo, Uzbekistan, and Yemen).

and the Year x communist dummy interaction on GDP, we found that the communist dummy significantly moderated the slope of the linear effect of Year on the GDP, where the slope of Year represents the degree of a linear trajectory of GDP. A simple slope analysis revealed that the slope of Year on GDP was greater in post-communist countries, $b = 0.09$, $SE = .003$, $p < .001$ than in non-communist countries, $b = 0.05$, $SE = .002$, $p < .001$. While post-communist countries had historically low wealth, they experienced more rapid economic growth in recent years than did non-communist countries.

We found some remarkable patterns regarding the differences in economic inequality between non-communist countries and post-communist countries. Post-communist countries on average had *lower* Gini by 6.58 compared to non-communist countries, $t(103) = -3.96$, $p < .001$. And yet, the trajectory of the Gini significantly depended on the history of communism. Regressing the Year and the Year x communist dummy interaction on the Gini in a societal growth curve model, we

found that the communist dummy significantly moderated the slope of the linear effect of Year on the Gini. Among post-communist countries, the Gini increased over time by 0.11 for every year, $b = 0.11$, $SE = 0.03$, $p < .001$, while the Gini remained fairly stable among non-communist countries, $b = -0.01$, $SE = 0.02$, $p = .74$ (Fig. 5). We next examined growth rates of inequality among countries that had at least two Gini observations over the period 1981-2019. While most of the post-communist countries (20 of 23) experienced an overall increase in economic inequality, only about a half of non-communist countries (30 of 55) showed an overall increase. The top five countries that showed more than 35 percent growth rates of economic inequality were post-communist: Romania, China, Russia, Lithuania, and Bulgaria. These post-communist countries also experienced a surge of religiosity during the same period. Taken together, patterns of economic inequality in post-communist countries coincided with patterns of religious change.
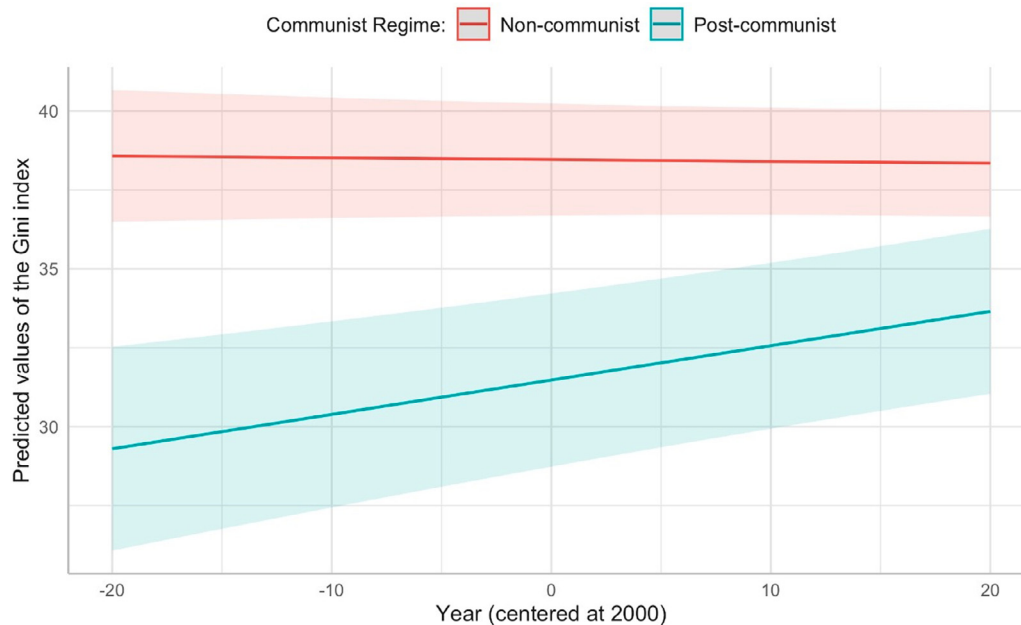
Fig. 5. Post-communist countries experienced greater increase in economic inequality over Year 1981-2019 than in non-communist countries. Note. Year is centered at 2000. The Gini index is derived from the SWIID version 9.1 (Solt, 2020).

In sum, post-communist countries are unique because of their distinct trajectories of religiosity and economic inequality despite rapid increases in economic wealth. These preliminary analyses support our assumption that in post-communist societies, modernization produces potential side effects, one of which entails economic inequality.

3.2. Multilevel modeling of religiosity across three levels of analysis

All analyses were performed using the *lme4* package (Bates et al., 2014) in R 4.0. Model 1 uses GDP and the Gini index to conceptually capture modernization and social complexity respectively, and Model 2 uses infant mortality rate as an alternative indicator of modernization to replicate the effects of GDP in Model 1. We first present results from Model 1, followed by Model 2. Model 1 in Table 4 shows all coefficients estimated by Eq. (2) with GDP as an indicator of modernization and Gini as an indicator of social complexity. We included all individual-level variables (sex, age, and well-being), within-country variables (GDP and Gini), between-country variables (GDP, Gini, post-communist dummy, and proportion of Christianity), and cross-level interactions between the within-country variables and the between-country variables to the general model specified by Eq. (2).

3.2.1. Level-1 effects

Pooling across years and countries, religious individuals tended to be those who were women ($b = 5.58$, $p < .01$), older ($b = 0.23$, $p < .01$), and happier ($b = .94$, $p < .01$). Particularly noteworthy is that old generations were more religious, consistent with Norris and Inglehart (2011). Of course, this individual-level relationship cannot be used to claim that secularization eventually takes place over time at the societal level. To avoid computational complexity, we did not examine potential variability in these individual-level effects across years and countries.

3.2.2. Level-2 effects

Within-country effects represent the degree to which longitudinal variation of within-country variables accounts for residuals of religiosity at level 2. Because the communist dummy is included in this model, the within-country effects refer to the effects pertinent to non-communist countries. The fixed effect of the Year was significant, $b = -0.20$,

$p < .01$, indicating that religiosity decreased every year by 0.20 in non-communist countries. The within-country effect of GDP was not significant, $b = -0.36$, $p = .71$, though the estimate was in the direction expected by modernization theory. Nonetheless, the present multilevel analysis helps us discern variability in the within-country effect of GDP, as it is allowed to vary by country. Fig. 6 depicts substantial variability in the slopes of the within-country effect of GDP on religiosity across countries, separated by levels of GDP (historically wealthy vs. historically poor). The slopes tend to be negative among countries with high historical wealth, whereas most of the slopes tend to be positive among countries with low historical wealth. This variability would not have been detected if the between-country comparison was the only analysis performed. Similarly, the within-country effect of Gini was not significant, $b = 0.26$, $p = .31$, though the effect was in the expected direction. Thus, the within-country level of analysis provides weak evidence for modernization theory (Prediction 1) and the cultural evolutionary account of religion (Prediction 2) partially due to the substantial variability in the slopes of the within-country effects.

3.2.3. Level-3 effects

At the country level, we found clear support for predictions derived from both modernization theory (Prediction 3) and the cultural evolutionary account of religion (Prediction 4). Historical differences in GDP significantly predicted the level of religiosity: wealthier countries, on average, showed lower levels of religiosity than poor countries, $b = -7.43$, $p < .01$. However, this between-country relationship does not mean that changing GDP is associated with changing religiosity as demonstrated in the level-2 effects and Fig. 6. To facilitate interpretation, we provide a correlation plot between GDP and religiosity at the country level in Fig. 7. This figure confirms the robust relationship between GDP and religiosity for both non-communist countries and post-communist countries, consistent with many of previous research. However, these cross-sectional patterns tell us nothing about the longitudinal relationship between GDP and religiosity within each country. These complex patterns illustrate the virtue of multilevel modeling: a between-country relationship by itself does not explain the processes of secularization within each country, and a within-country analysis yields substantial variability in the process of secularization across societies.

Table 4
Parameter estimates for religiosity at three levels of analysis

Fixed effects	Model 1			Model 2		
	Coeff	*SE.*	*p*	*Coeff.*	*SE.*	*p*
Intercept	66.59	1.13	<.01	65.15	1.26	<.01
Level-1: Respondent						
Female dummy	5.58	0.05	<.01	5.58	0.05	<.01
Age (centered at 30)	0.23	0.00	<.01	0.23	0.00	<.01
Well-being	0.94	0.02	<.01	0.94	0.02	<.01
Level-2: Country-year						
Year (centered at 2000)	-0.20	0.05	<.01	-0.37	0.05	<.01
GDP per capita (within)	-0.36	0.96	.71			
Gini index (within)	0.26	0.25	.31	0.36	0.28	.21
Mortality (within)				-0.27	0.17	.12
Level-3: Country						
GDP per capita (log)	-7.43	0.89	<.01			
Gini index	0.34	0.15	.03	0.72	0.15	<.01
Communist dummy	-8.96	2.38	<.01	1.01	2.33	.67
Christian proportion	0.04	0.03	.11	0.02	0.03	.57
Mortality				0.34	0.05	<.01
Interaction (level-2 x level-3)						
GDP x GDP	-1.98	0.62	<.01			
Gini index x GDP	0.20	0.25	.43			
GDP x Gini index	-0.07	0.08	.39			
Gini index x Gini index	0.04	0.03	.23			
GDP x Communist dummy	0.15	1.28	.91			
Gini index x Communist dummy	1.28	0.49	.02			
GDP x Christian proportion	0.02	0.02	.27			
Gini index x Christian proportion	-0.01	0.01	.04			
Mortality x Mortality				0.00	0.00	.99
Gini index x Mortality				-0.02	0.03	.42
Mortality x Gini index				0.02	0.01	.14
Gini index x Gini index				0.05	0.03	.10
Mortality x Communist dummy				-0.19	0.18	.31
Gini index x Communist dummy				0.94	0.40	.02
Mortality x Christian proportion				0.00	0.00	.10
Gini index x Christian proportion				-0.02	0.01	.01

| Random effects (Variance)	Model 1	Model 2
Level-1: Respondent		
Residual	359.35	359.35
Level-2: Country-year		
Intercept	8.20	7.59
Level-3: Country		
Intercept	77.39	95.97
GDP within	4.94	
Gini within	0.33	0.53
Mortality within		0.13
Level-1 N	488997	488997
Level-2 N	346	346
Level-3 N	100	100
df	24	24
-2 LL (Deviance)	4266682	4266705
AIC	4266730	4266753

Note. Level-3 predictors are grand-mean centered.

Historical differences in the Gini significantly predicted the level of religiosity: countries with greater economic inequality, on average, showed greater levels of religiosity than those with fewer economic inequality, $b = 0.34$, $p = .03$. The communist dummy was significant, $b = -8.96$, $p < .01$, indicating that post-communist countries were on average less religious than non-communist countries by 8.96. The proportion of Christianity did not significantly predict levels of religiosity, $b = -0.04$, $p = .11$, though the effect was in the predicted direction.

3.2.4. Cross-level interactions between level-2 effects and level-3 effects

While the within-country effects of GDP and Gini were not significant, cross-level interactions clarify variability in the observed within-country effects on religiosity. Indeed, we found that the between-country effect of GDP, the communist dummy, and the proportion of Christianity moderated some of the observed within-country effects

on religiosity. First, the within-country effect of GDP was qualified by the between-country effect of GDP, $b = -1.98$, $p < .01$. The significant interaction indicates that the observed within-country effect of GDP on religiosity significantly varied as a function of historical differences in the level of GDP (see Fig. 8A). We performed a simple slope analysis, which revealed that the within-country effect of GDP was negative among countries with high historical wealth (1 *SD* above the global mean of GDP), $b = -2.82$, $p = .01$, such that when GDP increased over time, religiosity declined. For instance, GDP growth accompanied the decline in religiosity in the Netherlands, which is historically wealthier than most other countries. However, the within-country effect of GDP was positively linked with religiosity among countries with low historical wealth (1 *SD* below the global mean of GDP), $b = 2.12$, $p = .11$: when GDP increased over time, so did religiosity. For example, India's average GDP is historically lower than most other countries: India's GDP sharply increased after 2000, but so did religiosity. This cross-level
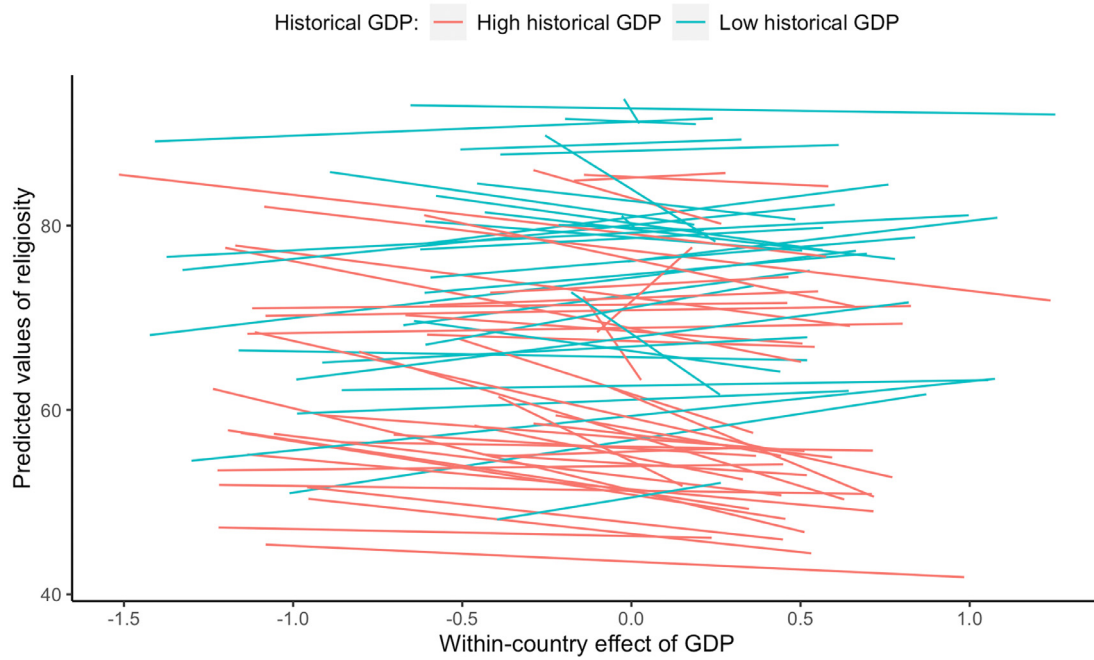
Fig. 6. Random-slopes of within-country effect of GDP on religiosity, moderated by levels of historical GDP
Note. China is an outlier and excluded for the ease of visualization in this graph. High historical GDP groups are based on countries with GDP above the global mean; Low historical GDP groups are based on countries with GDP below the global mean.
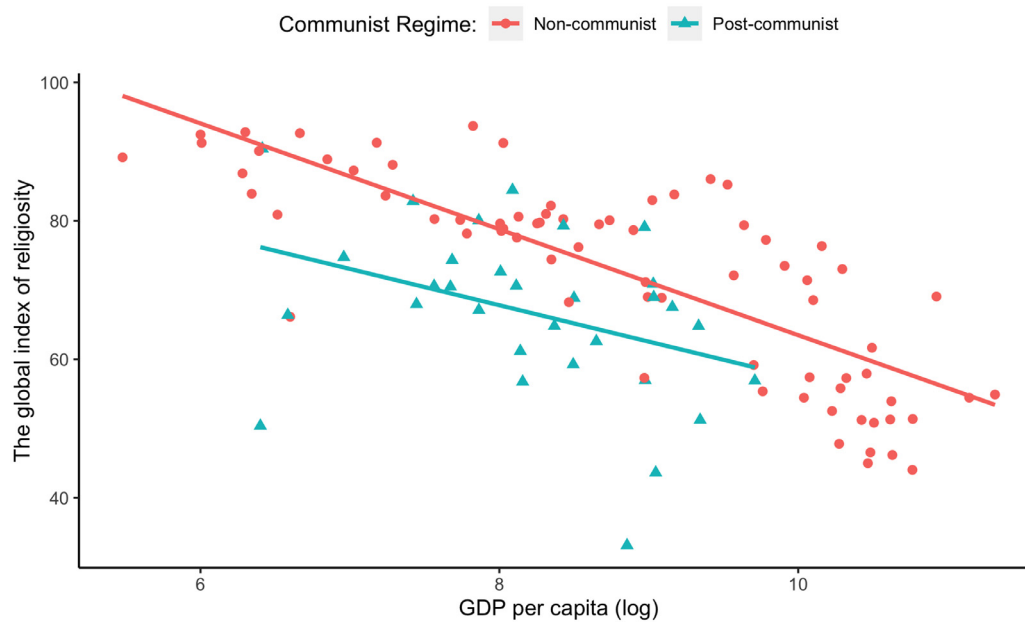
Fig. 7. The cross-country relationship between economic wealth and religiosity at the country level (level 3)
Note. The correlation between GDP and religiosity is strongly negative, r = -.66, while a slightly weaker relationship is observed among post-communist countries.

interaction supports Prediction 5. Increasing wealth was indeed associated with decreasing religiosity, but this longitudinal pattern was only prevalent among historically wealthy countries, not among historically poor countries, where we found the opposite pattern.

The within-country effect of Gini on religiosity was qualified by the communist dummy, $b = 1.28$, $p = .02$. This cross-level interaction means that the within-country effect of the Gini on religiosity is elevated in a positive direction among post-communist countries (Fig. 8B). Among post-communist countries, the within-country effect of Gini was positive, $b = 1.54$, $p < .01$: when the Gini increased over time, so did religiosity. For example, many post-communist countries

(e.g., Romania, China, Russia, Lithuania, and Bulgaria) experienced increased economic inequality and religiosity during the same periods. By contrast, the within-country effect of Gini had little impact on religiosity among non-communist countries, $b = -0.13$, $p = .67$. This cross-level interaction supports Prediction 6 to the extent that greater social complexity is associated with increasing religiosity in post-communist societies without institutional resources to mitigate the potential downsides of modernization.

The within-country effect of Gini on religiosity was also moderated by the proportion of Christianity, $b = -0.01$, $p = .04$ (Fig. 8C). In Christian-majority countries (e.g., Poland, Croatia), an increase in
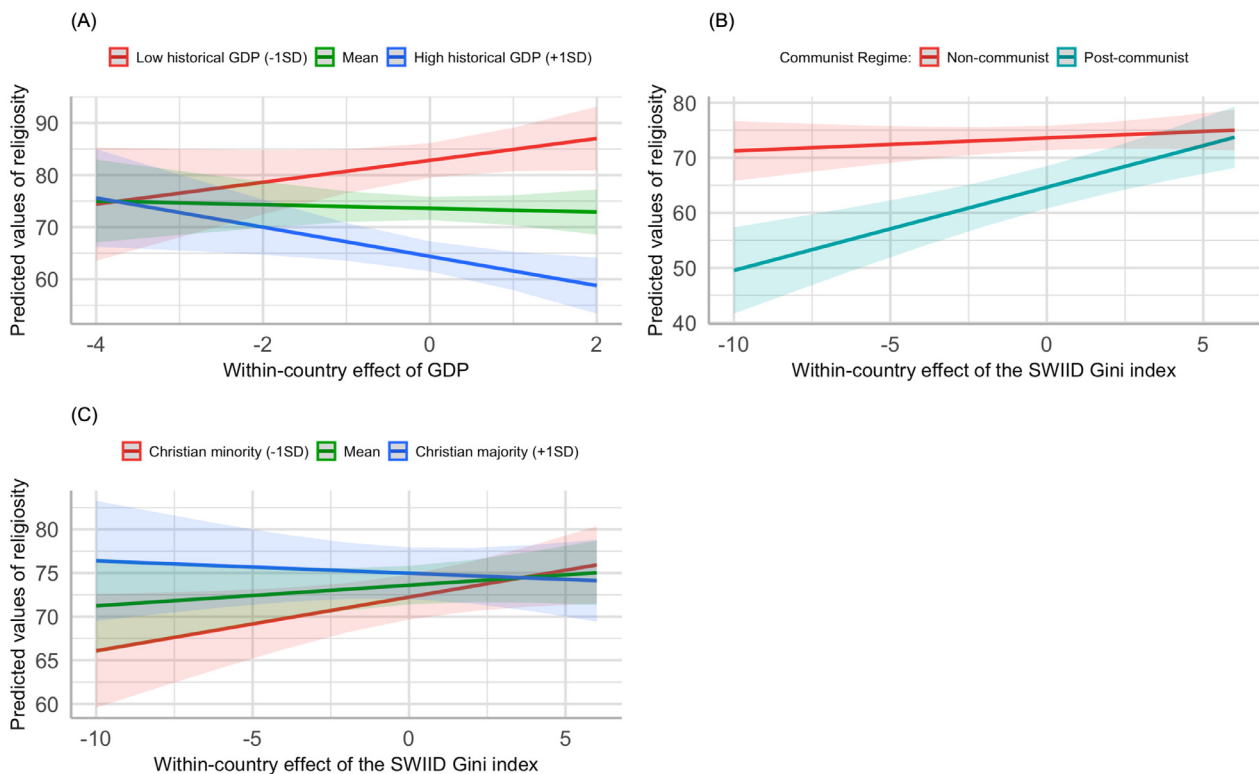
Fig. 8. Significant cross-level interactions estimated by Model 1
Note. (A). Within-country effects of GDP on religiosity are moderated by levels of historical wealth; (B). Within-country effects of Gini on religiosity are moderated by communist past; (C). Within-country effects of Gini on religiosity are moderated by the proportion of Christianity.

the Gini had little impact on change in levels of religiosity, $b = -0.13$, $p = .68$. However, an increase in the Gini positively predicted increasing religiosity in Christian-minority countries (e.g., Kyrgyzstan, Kazakhstan), $b = 0.65$, $p = .05$. Given that this interaction emerged over and above the effects of historical GDP and communism past, the moderating effect of Christianity speaks toward the historical effects of Western institutions and customs in promoting secularization (Henrich, 2020).

3.2.5. Infant mortality rate as an alternative indicator of modernization

We next sought to replicate the observed patterns by replacing GDP with the infant mortality rate in a separate model. Model 2 of Table 4 summarizes all coefficients. The modernization theory predicts a positive relationship between mortality and religiosity regardless of the level of analysis: when and where the environment is harsh, people tend to have greater needs for religion. We found that countries with historically high infant mortality rates tend to be more religious, $b = 0.34$, $p < .01$, consistent with modernization theory (Prediction 3). But the within-country effect of infant mortality rate on religiosity appeared to be *negative*, suggesting that when the mortality decreased (the environment becomes *safer*), religiosity *increased, b = -0.27*, $p = .12$. Moreover, the within-country effect of infant mortality rate did not significantly interact with any of the higher-level variables. In comparison with Model 1, the observed findings of Model 2 illuminate the salience of economic wealth as a historical and immediate force in shaping secularization more so than physical security.

Model 2 replicated the effects of the communism dummy and the proportion of Christianity on moderating the within-country effect of Gini, $b = 0.94$, $p = .02$, and $b = -0.02$, $p = .01$, respectively. Further analyses confirmed similar patterns consistent with Model 1: the effects of Gini on religiosity were greater among post-communist countries or countries with a low proportion of Christianity. In contrast, the Gini had little impact on religiosity in non-communist countries or countries with a high proportion of Christianity. These patterns support the ro-

bustness of communism and Christianity in moderating the effects of economic inequality on religiosity. When post-communist institutions (young democracies or autocracies) do not help mitigate negative effects (greater social complexity) of modernization, people increasingly rely on religion to secure social order; yet modernization poses a little problem in well-functioning democratic institutions, or when countries have a history of Christianity that promoted generalized trust, which led to secularization (Henrich, 2020). Conceptually, findings of Model 2 and Model 1 together support Prediction 6: modernization increases religiosity especially when institutions are not historically suited to ensure the potential benefits of modernization.

3.2.6. Alternative models

We ran several alternative models to ensure the robustness of the observed findings and checked residual assumptions[7]. We first repeated the above analyses by excluding country-year-level units with low alpha reliabilities ($\alpha < .40$) of the global index of religiosity to ensure that the observed results were not driven by measurement error. Despite the substantial loss of countries, the observed results were highly similar with greater clarity for our predictions. We also considered population age, a potential confounding variable to our analysis. We aggregated respondents' age for country-year units and created a within-country (country-mean centered) variable of population age. Our follow-up analyses indeed showed that in years when a society included a greater proportion of the older population, religiosity also increased. However, the inclusion of population age did not alter the main findings reported here, leading us to conclude that modernization influences religious change, not because of some years with older populations who tend to be religious. Finally, we included a comprehensive democracy score

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[7] See R codes for residual assumption checks. The models reported in the present study did not have their assumptions violated.

(Coppedge et al., 2021), Kinship Intensity Index (Schultz et al., 2019), and historical pathogen prevalence (Murray and Schaller, 2010) at level 3 in Model 1, as these are thought to have shaped historical differences in religiosity across countries. The inclusion of these variables did not alter the current findings. These additional analyses are summarized in the Appendix.

4. Discussion

We showed that historical variables consistently moderated the within-country effects of modernization on patterns of religious change. Within-country change in economic development was associated with lower religiosity in countries with high historical wealth but with greater religiosity in countries with low historical wealth. Increasing inequality predicted greater religiosity especially in post-communist countries, and countries with a greater proportion of Christianity did not see increased inequality influencing their levels of religiosity. These findings clarify previous confusion revolving around the variability in the process of secularization.

Modernization theory predicts that when societies prosper, people rely less on religion for ensuring survival, social order, and meaning in life, and this mechanism explains a wide range of societies including post-communist societies (Inglehart and Baker, 2000; Norris and Inglehart, 2011). We did find support for this prediction but also revealed systematic variability in religious change by decomposing variation into within-country and between-country processes. Our explicit analyses of within-country relationships generated evidence consistent with the cultural evolutionary account of religion to the extent that religiosity prevailed in response to increased social chaos, which we conceptualized using the Gini index. Previous cross-cultural research on pre-modern societies found that social, political, and economic complexity may be prominent characteristics of modernization (Johnson, 2005; Roes and Raymond, 2003; Underhill, 1975), and we found this pattern in post-communist countries. When institutions do not provide people with safeguards for societal growth, modernization may create greater incentives to rely on religion so that social and moral cohesion is maintained. We found the proposed pattern to be a unique case, especially among post-communist countries presumably because they struggle to reduce inequality during the initial transition to market economies despite rapid economic growth. As a result, social complexity in the form of economic inequality in these countries may have hindered psychological security.

We also found that greater economic inequality had little impact on religiosity in Christian-majority countries. This potentially speaks to the proposed process by which Western institutions had early advantages to build secular social networks that guaranteed psychological safety (Henrich, 2020). As we drew different inferences at different levels of analysis, the present multilevel modeling approach reconciled the divergent patterns of religious change. By explaining the source of variability in secularization, we conclude that modernization theory was only useful for explaining secularization in historically wealthy, non-communist societies, but religious changes in other societies seem to follow a different mechanism than proposed by modernization theory.

4.1. Future direction

Future research may test alternative explanations of the observed relationship between modernization and religiosity. The present research was motivated by modernization theory, which centers on the notion of existential security as a consequence of modernization. While existential security may include a range of ecological factors from poverty to wars, the all-encompassing definition of security may be problematic and subject to alternative conceptualizations. Take the theory of religious markets, for example. Proponents of this theory (Finke and Stark, 2005; Stark and Iannaccone, 1994) argue that competition between religious denominations intensifies people's need to believe in religion. Consequently, this theory attributes the decline of religiosity—mostly observed in Northern Europe—to the dominance of monopolized churches and lack of religious competition. Although this theory received empirical disputes (Norris and Inglehart, 2011), we argue that previous criticisms leveled against the religious markets hypothesis were limited by excessive reliance on cross-sectional analyses and lack of within-society analyses. Intergroup competition has been a significant driver of religiosity, at least based on historical and ethnographic evidence on pre-modern societies under the cultural evolutionary framework (Atran and Henrich, 2010). After the collapse of communism, many post-communist countries saw the revival of religious groups (e.g., Froese, 2001). Thus, religious competition may be a variant of intergroup competition or social complexity motivating needs for religiosity in some societies. Future research should apply our multilevel approach to test the religious market hypothesis with appropriate data.

Some theorists argue that the relationship between religion and Western prosperity is indeed causal, attributing the economic prosperity of WEIRD societies to early Protestantism or specific religious beliefs (Barro and McCleary, 2003; Henrich, 2020). Western religions like Protestantism may have inherent values associated with economic success such as capitalism (Hayward and Kemmelmeier, 2011), whereas other religious doctrines may not. If these explanations are true, we expect that the kind of secularization process observed in the present research only applies to certain religious doctrines. We indeed found that greater economic inequality predicted increasing religiosity only in Christian-minority countries. Since our variable of different religious doctrines was crude, future research may examine a more specific process by which non-Western religions respond to increased social complexity.

We do not yet know whether developing, post-communist societies will *ever* experience secularization for the same reasons that explain Western secularization. It might be the case that, in a much longer period than we covered in the present analysis, *any* society can have less religiosity once a certain level of economic development and existential security is achieved regardless of religious doctrines. This possibility may be dubbed a "tipping point" hypothesis, which offers an alternative interpretation of the observed findings. For instance, lower mean levels of religiosity observed among post-communist societies may be due to the lingering effect of transition towards democracy and market economies. But once these societies achieve a certain level of religiosity as well as economic and existential security in the future, we may observe declines in religion. Strictly speaking, the tipping point hypothesis adds a more specific mechanism to modernization theory, but it requires a much longer span of data. Future research will need to explore these possibilities within specific religious contexts with a much longer time span of data. Such research will clarify whether non-Western, post-communist societies will face secularization at all despite persistent modernization over the long run.

Future research needs to pay more attention to longitudinal observations of religiosity and aspects of modernization (economic growth, economic inequality) in underrepresented societies. While the World Values Survey provides the most comprehensive cross-cultural data on religiosity to date, it does not cover a handful of developing countries. For instance, Mongolia was not included in our data, but its demography suggests a high proportion of Buddhists despite consistent economic growth in the last few decades (Office of International Religious Freedom, 2019). Will further economic growth destroy religious values and practices in Mongolia? The modernization theory would predict so, but our findings generate an alternative prediction. Mongolia's religiosity may remain significant or even increase until the economy hits a certain threshold, or until the post-communist government establishes public services, infrastructures, or fiscal reform to facilitate the modernization process like mitigating potential economic inequality or reconciling ideological differences. Our analytical framework provides a potential way to make sense of diverse patterns of religious change

in under-represented societies not included in our analyses rather than ignoring them as "anomalies."

4.2. Implications for cross-cultural research on cultural change

We believe that our approach has much to offer for cross-cultural research on cultural change. Recent work in psychology has gained growing interest in cultural change (Varnum and Grossmann, 2021). Indeed, much work on cultural change implicitly accepts the basic assumption of modernization theory: when societies prosper, improvement in existential security produces greater individualism. As a result of urbanization, wealthy households place greater emphasis on individualistic values in child-rearing (Greenfield, 2009). Longitudinal works in the United States and the United Kingdom linked reduced levels of pathogens with greater individualism (Grossmann and Varnum, 2015; Varnum and Grossmann, 2016). Others found that aspects of individualism—narcissism, self-esteem, and desire for uniqueness—increased over time within the United States (Twenge and Campbell, 2001; Twenge et al., 2008). Cultural change toward greater individualism has been also found in East Asian countries such as China (Cai et al., 2018) and Japan (Ogihara et al., 2015; Hamamura, 2012). All of these studies showed that wealthy societies became individualistic in systematic ways.

This line of research can benefit from the current multilevel framework to study cross-cultural differences in the trajectories of cultural change, especially in underrepresented societies. Although many previous studies used intensive longitudinal data to examine patterns of cultural change, they were limited to single-nation analyses (e.g., Twenge et al., 2008). As a result, those studies have difficulty explaining how the process of cultural change observed in wealthy, democratic societies might systematically differ from underrepresented, developing societies. Our work demonstrated that the basic assumption of modernization theory should not be taken for granted. Recent studies using multilevel modeling are beginning to explain different trajectories of cultural change in a unified fashion (Kusano and Kemmelmeier, 2020; Schröder, 2018). As research on cultural change has become a growing enterprise in psychology and other behavioral sciences, the field is ripe with rich data and advanced statistical approaches. We aimed to offer one such framework using a real example of religious change.

4.3. Limitations

Our findings must be interpreted with several limitations in mind. First, countries differ on many other dimensions, and there are alternative ways to distinguish one country from another. Although we believe that GDP, communist history, and proportion of Christianity are important dimensions that explain historical institutional differences in the propensity of modernization, researchers may find alternative indicators more desirable. Likewise, religiosity across countries differs on specific doctrinal dimensions that carry specific heritages. Future research may develop various ways to classify religious doctrines around the world and investigate specific effects of historical heritage (e.g., Catholicism vs. Islam) on the trajectories of religious change.

Second, many individual-level variables were dropped to analyze time-series cross-sectional (TSCS) data. Indeed, respondent-level variation was much greater than longitudinal and between-country variation, and one may test various predictions more fully at the respondent level (see Table A3 of the Appendix). For instance, Hayward and Krause (2015) conducted an age-cohort analysis on religiosity using the WVS/EVS data and found that older individuals tend to be more religious, and this relationship was stronger among English-speaking, Western countries. To be clear, our multilevel approach can address the same question and further clarify the variability of the cohort effects across time and societies. Indeed, what seems to be scarce in the literature on secularization is research on intra-individual development of religiosity with a careful distinction between levels of analysis. When

religious individuals gain economic status and greater health security, do they become less religious? Future research may explore secularization dynamics within and between individuals, and their interactions with higher-level processes such as within-society change and historical between-society differences.

Third, one may be concerned with the validity of the present global index of religiosity. Our goal to cover as many country-level observations as possible indeed compromised the accuracy of the index. To gain more confidence in our results though, we did conduct measurement invariance testing on the index before the main analyses and found reasonable comparability across all cultural groups (see the Appendix). However, one may impose even more stringent standards on measurement invariance of religious items. Future work will need to improve the comparability of religious questions in this type of international survey.

Finally, our TSCS data were unbalanced and limited in length. This should not be a huge constraint for the present multilevel regression approach, which does not require balanced time points. However, this limitation precluded us from investigating more complex causal dynamics involving bidirectional causality or lagged effects. If more balanced data is available, researchers may take advantage of other approaches such as a general cross-lagged panel model in structural equation modeling (Zyphur et al., 2020).

5. Conclusion

Modernization theory has long contended that economic development and modernization will replace religions with secular values. On the contrary, we observed systematic variability of religious change within unique historical contexts: religiosity increased when modernization took place in countries with low historical wealth, communist history, and a low proportion of Christianity. While previous research on secularization shied away from explaining "anomalies," our multilevel approach made sense of them by carefully distinguishing within-society processes from between-society processes. We believe that this article provides a promising next step to pursue the complex multilevel processes of religious change, and more generally, why different societies experience societal/cultural change differently.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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