

A Polluting Creed: Religion and Environmental Inequality in the United States

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## **Abstract**

Research on religion and the environment primarily focuses how religion shapes environmental attitudes, but this leaves aside how this connection links to observable levels of pollution. This article outlines three elements by which religion and environmental inequality are related: the cumulative effect of religious worldviews, free market outlooks held by some religious adherents, and the bridging or bonding character of social ties of religious adherents. These three elements are analyzed by examining the relationship between industrial air pollution and the proportion of population in metropolitan areas that are conservative Protestant, Mainline Protestant, Catholic, and a composite measure. Results show that the composite measure is associated with more industrial pollution. But important distinctions between religious groups show that a greater proportion of conservative Protestant Evangelical adherents are associated with greater pollution, but that Catholic and Mainline Protestant adherents are not. These findings suggest the importance of renewing research between religion and environmental degradation.

## A Polluting Creed: Religion and Environmental Inequality in the United States

Research in the environmental justice tradition shows how environmental disparities across locales are conditioned by the racial and class composition of those places (Ard 2015; Mohai and Saha 2015). This research analyzes *neighborhoods* as the primary geographic area of interest, importantly so because these relatively small scales most validly measure toxic exposures and because of three decades of evidence of inequalities across neighborhoods.

An additional, decisive, and underexplored scale in determining how much industrially produced toxic air to which one is exposed is the *metropolitan area* in which one resides. These metropolitan disparities, as evinced in more detail below, can be large: as much of three quarters of the variation in industrial air pollution levels in 2010, for example, is accounted for across metropolitan areas. This indicates that the metropolitan area in which one resides is a primary way that Americans unequally experience exposure to industrial air pollution. While research on neighborhood environmental inequalities employs strong theoretical frameworks and can be found in hundreds of studies of detailed empirical evidence, we have a limited sense theoretically and empirically what drives these metropolitan environmental inequalities. Some studies find that more spatially unequal metropolitan areas are subject to greater levels of pollution and environmental inequalities (Ard 2016; Morello-Frosch and Jesdale 2006), while others theorize how economically unequal urban areas may have more pollution but few

findings support this (Downey 2007; Downey et al. 2008). More than this, there is little to offer in terms of a comprehensive theoretical framework of why large disparities across metropolitan areas are found.

In an effort to initiate theory building on why metropolitan disparities are found in exposure to industrial pollution, I argue that the most polluted metropolitan areas have a “polluting creed,” a set of wide-reaching informal norms and beliefs in a metropolitan area that undergird the actions of formal institutions in economy and government, and in turn are shaped by these formal institutions across time. In this article, I focus especially on the role of religion as part of this socio-political context of metropolitan areas that comprise a polluting creed.

Among the social processes that shape environmental inequality, we might not typically think of religion. But religion can be linked to the environment in three crucial ways. First, the cumulative nature of religiously shaped environmental beliefs in an urban area provides a baseline through which many residents conceive of human-environment relationships (Sherkat and Ellison 2007; Arbuckle and Konisky 2015). Second, this baseline of beliefs further extends to the wider production of social inequality, as conservative Protestants are particularly associated with individualist cultural tool kits that do not assess inequalities structurally (Emerson and Smith 2000; Tranby and Hartmann 2008). Third, different religious denominations are characterized by different types and amounts of social ties, such as bridging and bonding ties; the implication is that the social capital in a place will vary depending on number of religious adherents (Paxton

2007). In investigating metropolitan disparities in industrial air pollution exposures by studying levels of religious adherence, this article avers that three elements outlined above are part and parcel of a polluting creed that conditions (and is conditioned by) the production of pollution in an urban area. I further delve into these linkages by considering the contrasting roles that different religious groupings – Catholics, conservative Protestants, and Mainline Protestants – play in the polluting creed.

This analytical framework advances research on religion and the environment to the production of environmental degradation. Nearly all research on the environment-religion nexus utilizes survey research on individuals or in-depth interviews that centers the discussion on an individual's perceptions, behaviors, or actions (e.g. Schwadel and Johnson 2017; Shao 2017; Sherkat and Ellison 2007; Wilkinson 2012). But these viewpoints have not been coupled with empirically observable levels of environmental degradation, although well-known theoretical frameworks from Max Weber (2002; Foster and Holleman 2012) and Lynn White (1967) propose deep connections between anthropocentric religious worldviews and ecological crises. The overall effect of this analytical framework pushes research on religion and the environment beyond individuals, and proffers the possibility to unlock critical clues into disparities in industrial pollution across metropolitan areas.

## RELIGION AND THE ENVIRONMENT

Research on religion and the environment primarily focuses on how anthropocentric views lead to exploitation of the environment. Early roots of this

perspective are found in the writings of Max Weber (for examples, see Foster and Holleman 2012, 1637). As contemporary environmental sociology shows, the rise of capitalism and the exploitation of the environment are deeply intertwined processes (Foster, Clark, and York 2010). Weber's perspective couples capital and the environment through a process of cultural refraction that anchors the environment through culture (Foster and Holleman 2012). One way in which these processes were initiated was with the very rise of capitalism itself via the cultural logics embedded in the "Protestant Ethic" (Olson 2019; Weber 2002). The religious views contained in the Protestant ethic, namely that economic benefits were a sign of the providence of God, catalyzed the development of capitalism, and, by extension, the exploitation of the environment.

A second historical root intertwining the environment and religion is Lynn White's famous thesis that Judeo-Christian religion as a philosophical and cultural ideal constitutes an anthropocentric worldview (White 1967). This worldview is based especially in the Bible's writings on human dominion over the natural environment, and that this worldview underwrites growing ecological crises. This influential thesis both initiated social research on religion and the environment at the same time that it cast religion as more monolithic than later research has found (Eckberg and Blocker 1989; LaVessuer and Peterson 2017).

Given these relationships between religion and the environment, scholars in recent decades have studied how environmental beliefs are shaped by religiosity (McCright and Dunlap 2011), denominational affiliation (Konisky 2018; Shao 2017), and

theological beliefs (Barker and Bearce 2013; Sherkat and Ellison 2007).

Methodologically, this research primarily has utilized surveys, and, to a lesser extent, qualitative research methods. The result of this is a maturing research tradition that effectively analyzes individual environmental concern. But it leaves aside the implications of these concerns, namely how religion connects to empirically observable levels of environmental degradation.

With this research on the environment and religion beliefs as backdrop, I outline three elements that connect the religious contexts of places to levels of environmental degradation. The three elements are: (1) religiosity and theological beliefs, (2) views on individualism and free markets, with its relevance for inequalities (3) the “bridging” or “bonding” nature of social capital from religious organizations and degrees of civic engagement across denominational affiliations.

### *Religious Views on the Environment*

How perceptions of the environment are shaped by religion is typically analyzed with three conceptualizations of religion: religiosity, denominational affiliation, and theological views. First, religiosity, often measured as the frequency of church of attendance, helps to construct one’s worldview on the environment. Evidence on the relationship between frequent attendance of religious services and environmental beliefs is mixed (Clements, McCright and Xiao 2014; Peifer, Khalsa, and Ecklund 2016), with some finding a positive association (Shao 2017), others a negative association (Arbuckle and Konisky 2015; Sherkat and Ellison 2007), or no association at all (Hagevi 2014).

Second, the mixed evidence found for religiosity is partly clarified by denominational affiliations that showcase key differences among religious individuals. This research shows that conservative Protestants,<sup>1</sup> compared to Catholics or Mainline Protestants (and others, see Arbuckle and Konsiky 2015), are less likely to exhibit concern for the environment (Sherkat and Ellison 2007), support spending on the environment (Carlisle and Clark 2018), believe the findings of climate change scientists (Ecklund et al. 2017), or characterize climate change as a serious concern (Arbuckle 2017; Shao 2017). At the same time, other research highlights how some conservative Protestants consider environmental stewardship as an increasing integral part of their faith (Danielson 2013; Wilkinson 2012), though this may be partly due to cohort differences that would be found across faiths (Carlisle and Clark 2018) and may be aimed at comparatively individualistic behavior change instead of attending to larger structural concerns (Peifer, Ecklund and Fullerton 2014).

Third, using denominational affiliation is partly a proxy for specific systems of theological beliefs, which similarly shape environmental attitudes. Most prominently, biblical literalism is correlated with less concern for the environment (Eckberg and Blocker 1989; Kilburn 2014; Peifer, Khalsa, and Ecklund 2016; Schwadel and Johnson 2017; Sherkat and Ellison 2007; Smith, Hempel and MacIlroy 2018). Similarly, a belief in end-times theology inhibits concern for long-term environmental changes (Barker and Bearce 2013). These theological beliefs are more often associated with conservative Protestants than with other Christian denominations, and therefore serve as the elements that lessen environmental concern among conservative Protestants compared to other



faith traditions (Schwadel and Johnson 2017). They are part of a broader conservative Protestant theodicy that favors individualist explanations for social phenomena over more collective ones (Blanchard et al. 2008). In sum, conservative Protestants and theological beliefs often associated with conservative Protestants suggest that urban areas with more of these adherents may have greater levels of environmental degradation because of anthropocentric belief systems that have a negative impact on the environment.

### *Views on Individualism, the Free Market, and Inequality*

It is not just that religious beliefs connect to environmental worldviews, but that religion also connects with social inequality (Emerson, Korver-Glenn and Douds 2016; Emerson and Johnson 2018; Wilde and Glassman 2016). Distinctions can be made across denominations in how different religious subcultures relate to social inequalities (Edgell and Tranby 2007; Hinojosa and Park 2004; Olson 2019; Wilde and Glassman 2016). Most notably, white conservative Protestant congregations are organizational channels through which individualist viewpoints on race and social structure are foregrounded as part of a cultural tool kit reliant on a free market ideology (Emerson and Smith 2000; Tranby and Hartmann 2008). These beliefs also include an otherworldly theological orientation that minimizes the material and social realities of day-to-day life (Blanchard et al. 2008). This tool kit translates into less support for race-based policies for conservative Protestant whites compared to Mainline Protestants (Brown 2009), more support of conservative political groups (McDaniel and Ellison 2008), the maintenance of racial residential segregation (Mulder 2015), less trust of the overall population (Hempel,

Matthews, and Bartkowski 2012), and lower support of local social institutions like healthcare (Blanchard et al. 2008). The implications of these previous studies is that urban areas with more conservative Protestant adherents may be correlated with greater environmental degradation because of a widely held free market ideology that supports economic outputs even at great environmental cost.

### *Religious Organizations and Social Capital*

The third area uses a social capital perspective to analyze social ties in religious organizations, which are a primary site of civic participation, community, and social capital in the United States (Ammerman 1997; Bellah et al. 1985; Becker 1999; Putnam 2000). Research on the density of religious organizations or adherents in a geographic area often focuses on how it is associated with better social outcomes such as education (Israel, Beaulieu, and Hartless 2001) or health (Lee 2010; Maselko, Hughes, and Cheney 2011).

While much research conceives of social capital as the same across religious organizations, the nature and type of ties within an organization often varies by organization type, diverging on whether the ties are most characterized by “bridging” or “bonding” properties (Kwon, Heflin, and Ruef 2013; Paxton 2007; Author Cite). For conservative Protestant organizations, the social ties are primarily *bonding* ties that connect group members to each other, and not to outside organizations (Schwadel 2005). This is often for tasks within the organization, such as volunteer work to improve church infrastructure (Hoge et al. 1998; Wilson and Janoski 1995; Wuthnow 1999). By contrast,

social ties in Mainline Protestant and Catholic churches often extend beyond the congregation itself, thereby having *bridging* properties that connect to the wider community. In practice, it means that adherents of these groups do more volunteer work in the community, participate in other non-religious community organizations or coalitions, and are more trusting (Braunstein, Fulton, and Wood 2014; Iannaccone 1994; Welch, Sikkink, and Loveland 2007; Wuthnow 1999). Because of this, Mainline Protestant and Catholic organizations might be thought of characterized by bridging social ties, at least in comparison to the bonding characterization of conservative Protestants (Beyerlein and Hipp 2005; Beyerlein and Hipp 2006).

Research testing distinctions between community levels of bridging and bonding social capital within religious organizations has at its point of departure that the levels of religious adherence and organizations vary, providing different religious ecologies across places that relate to inequalities in countervailing ways (Lee and Bartkowski 2004). Beyerlein and Hipp (2005) found that counties with more conservative Protestant adherents had higher crime rates, but that counties with more Mainline Protestants and Catholics were associated with less crime. Shihadeh and Winters (2010) find that in new immigrant destinations for Hispanics, the rate of violence is highest in places with more Mainline Protestants but fewer Catholics. These crime links are found across other studies as well (Brault and Shihadeh 2018; Lee and Bartkowski 2004; Harris and Feldmeyer 2015). Blanchard et al. (2008) found a similar relationship split by the denomination types but for mortality: places with more conservative Protestants had greater social disadvantage in mortality than those with Mainline Protestants and

Catholics (see also Lee 2010). Similarly, these contextual religious effects are found for other health effects such as infant mortality rates (Bartkowski, Xu, and Garcia 2011; Garcia, Bartkowski, and Xu 2017), self-rated health (Stroope and Baker 2018), and alcohol and drug use rates (Nie and Yang 2018; Nie, Yang, and Olson 2018). Other studies using national data on religious adherents and organizations have linked differences between these groups to residential segregation (Blanchard 2007), social mobility (Clark and Stroope 2018), social trust (Marshall and Olson 2018), hate crimes (Howell et al. 2018), gambling (Eitle 2011), cohabitation rates (Gault-Sherman and Draper 2012), and teen birth rates (Ovadia and Moore 2010). Following this work, metropolitan areas with more conservative Protestants might be associated with more environmental degradation, while those with more Mainline Protestants or Catholics might be associated with lower levels.

## ENVIRONMENTAL INEQUALITY ACROSS METROPOLITAN AREAS

Research on environmental inequality in the environmental justice tradition highlights how neighborhood disparities in environmental ills are driven primarily by the racial and class composition of the neighborhood (Bullard 1990; Mohai, Pellow and Roberts 2009). Less research has investigated disparities across metropolitan areas and how these disparities might condition neighborhood inequalities, but two areas of analysis have emerged to analyze these metropolitan disparities. One area finds that urban areas that are more residentially segregated are also more industrially polluted. Ard's (2016) examination of residential finds that some residential segregation measures,

such as popular measures of evenness (like the dissimilarity index), were not consistent predictors but that directly spatial measures were more highly related (see also Downey 2007; Downey et al. 2008; Lopez 2002; Morello-Frosch and Jesdale 2006). The second framework concerns material inequality, but finds that income inequality by race is not associated with metropolitan industrial pollution (Downey 2007). Taken together, these studies indicate mixed findings for key variables of interest, like residential segregation and racial income inequality.

This environmental justice research initiates a research gap: we have only limited evidence in why disparities in exposure to industrial pollution have come to be across metropolitan areas. Previous research has not utilized the lens of religion to analyze these disparities. Some environmental justice research has discussed religion, such as in environmental justice organizing (Binder 1999; Bullard 1990; Stretesky et al. 2011; Taylor 2000) and in supporting early research (UCC 1987), but not by studying how religious ecologies relate to levels of environmental degradation across geographies like metropolitan areas.

## SUMMARY OF LITERATURE

Religion has long been linked to the environment, but little research since Weber (2002) and White (1967) has connected religion and environmental degradation. This is despite a body of research about the environmental views of individuals that has powerfully suggested how religion underpins how many think and act on the environment (Eckberg and Blocker 1989; Peifer, Khalsa, and Ecklund 2016; Sherkat and Ellison 2007;

Wilkinson 2012). This environment-religion connection is theorized to have three primary elements: (1) through the cumulative anthropocentric beliefs of adherents, (2) through the free market and individualist cultural worldviews especially espoused by conservative Protestants, and (3) through bridging or bonding social capital sponsored by religious organizations.

The argument here is that these three elements combine as part of a polluting creed of a metropolitan area that is translated in local politics, civic networks and the local relationship between industry and the environment. In this way, the religious backdrop of a metropolitan area can be thought of as part of a religious ecology that provides a moral community (Lee and Bartkowksi 2004) as well as local religious and public subcultures (Olson 2019; see also Stack 1996). The moral communities thesis states that the patterns of civic engagement in faith traditions and the cultural resources in a place condition social outcomes in that place. The ideas behind moral communities or local religious and public subcultures can be connected to the environment by considering how the place tradition in an urban area affects socio-environmental outcomes (Molotch, Freudenberg, and Paulsen 2000). In their study of Santa Barbara and Ventura in California, Molotch, Freudenberg, and Paulsen (2000) analyzed how the social organization and built environment of each city created a “place tradition” that structured urban trajectories relating to the economy and environment. This study’s focus on industrial air pollution in particular connotes the connective tissue between economy and environment. The social backdrop of community through religion may affect the economic, social, and environmental systems at the core of a metropolitan economy,

thereby renewing a focus on how the interrelation of urban systems comprise the foundation for culture and inequalities in a place (Author Cite; Emerson and Johnson 2018; Olson 2019).

More closely, these three elements and the polluting creed of place suggest that places with more conservative Protestant adherents will be correlated with greater industrial air pollution. This can be thought of in the vein of the “closed communities” thesis that highlights how the community network ties and cultural worldviews associated with conservative Protestants foster greater social inequality (Blanchard 2007). Using the framework of the three elements, this relationship is hypothesized to occur because these urban areas will have a greater percentage of individuals who have religious beliefs that are anthropocentric (for example, believing that humans have dominion over nature), more individualist and otherworld-minded viewpoints that attenuate environmental protection through a relatively unfettered free market, and through the insular, bonding social ties typical of conservative Protestant adherents. These anthropogenic beliefs and individualist viewpoints may underwrite a context in which civil society attention to pollution from corporate actors is comparably low. The community ethos supplied may encourage economic growth with little thought or interest in the environmental externalities that can come about because of industrial air pollution. A metropolitan area characterized by this free market mantra even with a high degree of industrial pollution may be attractive to conservative Protestant movers as well. Further, the high degree of bonding social capital could inhibit the ability of civil society groups like religious

organizations to connect with one another through coalition building to address community environmental issues.

By contrast, an opposite effect, or possibly a null effect, is hypothesized for the levels of Catholics and Mainline Protestants. Compared to conservative Protestants, Catholics and Mainline Protestants have religious worldviews that support human stewardship of the planet, less likely to espouse individualist viewpoints, and more likely to have bridging ties to the wider community; this suggests support for metropolitan area with more of these two groups to be less polluted. Following White (1967), though, we might expect that any Christian denomination would be linked to more environmental degradation, so this might suggest a positive association or, compared to conservative Protestants, a null association.

## DATA AND METHODS

### *Religious Adherents and Metropolitan Measures*

Data for the primary independent variables in the study are drawn from the U.S. Religion Census' Religious Congregations and Membership Study (RCMS) for metropolitan areas. The data was collected by the Association of Statisticians of American Religious Bodies (Grammich et al. 2012). RCMS uses the *Yearbook of American and Canadian Churches* as its sampling frame, and primarily contacted national offices of religious organizations to obtain data. Data were collected on the congregations and the number of adherents from 236 different religious denominations. An analysis of the RCMS data compared to other major sources of data on American



religions indicate that the data is reliable, particularly so for the measurement of Christian religious groups (Lim 2013).

Four primary independent variables are measured at the metropolitan level: the proportion of the total metropolitan population that are (1) Mainline Protestant adherents, (2) Catholic adherents, (3) conservative Protestant adherents, and (4) the total of Mainline Protestant, Catholic, and conservative Protestant adherents.<sup>2</sup> A fourth group, adherents of Black Protestant churches, are also measured by the RCMS, but are not included in the present study because of concerns about correlation between metropolitan racial composition and black Protestant adherence.<sup>3</sup> Importantly, only Christian denominations are specified in this study because of their relative size in the American context, and the work here does not empirically study or theoretically propose how other faith traditions may relate to pollution.

This article also tests for importance controls including the political, spatial, racial, economic, and regional contexts of metropolitan areas. Politically, more conservative politics in an area may lead to less support for environmentally friendly policies (e.g. Krause 2011). Because conservative Protestant congregations, and to a lesser extent religious organizations overall, are often linked to conservative political views, this tests whether any findings relating to religion are found net of local political culture. This variable is measured as the proportion of voters in a metropolitan area who voted for the Republican candidate for President, John McCain, in 2008.

Additional control variables draw on data from the decennial 2010 U.S. Census and the 2006 to 2010 American Community Survey. These data are also utilized for the tract-level variables. To assess spatial context of the metropolitan area, residential segregation is measured using a Global Moran's I for each metropolitan area in the analysis. Previous research suggests that spatial measures of residential segregation are better predictors of environmental inequality than other measures of residential segregation (Ard 2016). The Global Moran's I is a test of the relative clustering or dispersion across spatial units for a variable, in this case the proportion in a tract that is black or Hispanic. The test utilizes a queen-one, row standardized contiguity matrix which uses the average racial composition of adjacent tracts as the basis for the statistic. Metropolitan areas where adjacent tracts are highly similar in their racial composition are considered clustered. The statistic varies from -1 to 1, with values toward -1 denoting relative dispersion, those closer to 0 denoting relative randomness, and 1 denoting clustering.

The racial composition of the metropolitan area is measured by the overall percentage of black and Hispanic residents (Downey et al. 2008). The economic context is measured using the median income of the metropolitan area. Finally, the census region in four categories is a control (East is the reference category). Supplemental analyses two use alternate conceptualizations of regions: dummy variables for nine EPA regions and a binary South and non-South measure. Regional differences in industrial air pollution levels are evinced in previous research (Ard 2015), and the RCMS data shows that religious groups are patterned across regions. For example, conservative Protestant

adherents are more concentrated in the South than elsewhere (Grammich et al. 2012). This research controls for these relationships with the region variables, and through spatial multilevel modeling (see more below).

### *Industrial Air Pollution*

The dependent variable is the tract-level exposure to health risks from industrial air pollution. Data is from the U.S. Environmental Protection Agency's Risk-Screening Environmental Indicators Geographic Microdata (RSEI-GM). The RSEI-GM utilizes Toxic Release Inventory (TRI) data on large, heavy polluting industrial facilities to measure the health risks across small-scale geographies from chemical air emissions. Using a GIS, the RSEI-GM measures the plume, fate, and decay of the emissions across space. Each industrial facility from the TRI is plotted at the center of an 810 m<sup>2</sup> square grid cell that is part of a national grid of equal size cells across the contiguous United States. The estimates for the chemical emissions are made for each grid cell within a 49 kilometer radius of the facility. The total amount of releases indexed to the toxicity of the chemicals for human health is calculated for each grid cell, and denotes the "toxic concentration" of that area. This toxic concentration variable can be understood as the health risks from the emissions of large industrial facilities. The variable is unitless, and values are relative to one another. Values of the toxic concentration are proportionately allocated from the grid cells to census tracts to determine the toxic concentration values (for a full description, see Ard 2015).

### *Neighborhood Measures*

Several independent variables at the tract level are employed. First, the proportion black or Hispanic at the tract level is included, as previous studies indicate that these groups are disproportionately exposed to environmental degradation (e.g. Downey 2007). Second, the median income is included to test for class differences (Downey and Hawkins 2008). Third, the proportion of owner-occupied homes denotes the defensiveness of place from homeowners. Fourth, the proportion of the employed population in manufacturing occupations controls for the possibility that these workers may live near heavy polluting facilities (Sicotte and Swanson 2007). Fifth, the population of the tract is controlled for how population size may be related to pollution exposure. To ensure validity in the estimates of the tract-level measures that utilize data from the American Community Survey, tracts were not included in the analysis if they had an employed population fewer than 100. The final total of tracts in the analysis is 58,781 in 363 metropolitan areas in the contiguous United States.

### *Analytic Strategy*

The analysis below first analyzes descriptive statistics, particularly between metropolitan areas in their levels of toxic concentration and in religious adherents. The regression analyses utilize a two-level spatial multilevel modeling approach. The lower level, the census tract, conceptualizes the small-scale area of pollution exposure as well as integral neighborhood attributes. The higher level, the metropolitan area, tests important hypotheses about religious adherence in addition to control measures. The modeling approach first examines the overall religious adherence measure, and then

analyzes the decomposed measures of religious denominations. All variables at the census tract level are group mean centered and all variables at the metropolitan level are grand mean centered. One important note is that this study does not rely on statistical significance testing because the study focuses on a population (that is, all tracts in metropolitan areas in 2010), not a sample. Instead, careful consideration of effect sizes is used to distinguish between the statistical relationships (Firebaugh 2008). At the same time, statistical significance is reported in the table of regression findings, although they are not discussed in the article.

The analytic strategy draws on novel advances in spatial multilevel modeling (Dong et al. 2015; Dong and Harris 2015). Specifically, a spatial lag is employed in the multilevel hierarchical linear model that controls for potential spatial autocorrelation in levels of industrial air pollution between metropolitan areas, the primary unit of analytical interest in this study. Using a spatial lag between metropolitan areas has the effect of controlling for similarities between units that are geographically closer to one another than those that are further away, a necessary step given that the linear regression assumption about independent and identically distributed standard errors can be violated in models using spatial data. The spatial lag used in this study is a  $k$ -nearest neighbors weights matrix that assigns the six nearest metropolitan areas as spatially adjacent neighbors. This weights matrix was chosen over those for distance-based matrices and other  $k$ -nearest neighbors specifications because Deviance Information Criterion values that assess model fit were lower (indicating better fit) for those with a  $k$ -nearest neighbors weights matrix of six.<sup>4</sup> Together with the dummy variables for census regions (see

above), the use of a metropolitan-level spatial lag helps to account potential regional bias in industrial air pollution and with religious adherence. This is especially useful given potential issues relating to how primary independent variables relating to religious denominations may be patterned by region, such as with conservative Protestants in the U.S. South. The spatial lag is particularly helpful as the six nearest neighbors corresponds to a much narrower definition of region than the census regions, thereby providing a complement to it.

## RESULTS

### *Descriptive Analysis*

Exposure to industrial air pollution in the United States is highly unequal. Table 1 indicates the mean, standard deviation, range, and coding of all study variables. The mean toxic concentration for tracts in this analysis is 8,821.49, and the median is 1,229.63. This large difference shows the strong rightward skew of the toxic concentration measure, which is partly accounted for in models by using a log of the dependent variable. Tracts at the 75<sup>th</sup> percentile of the toxic concentration value (value = 4748.88) are nearly sixteen times more toxic than those at the 25<sup>th</sup> percentile (value = 298.81). Moreover, these differences at the top are structured by metropolitan area. Of the 363 metropolitan areas in the data, 138 do not have any census tracts among the most toxic twenty-five percent in the United States, and another 74 have fewer than five such tracts, meaning that a majority (58.4 percent) of metropolitan areas have few of these relatively polluted tracts. While those 58.4 percent of metropolitan areas host but 4

percent of the overall neighborhood pollution in metropolitan America, the most polluted 36 metropolitan areas host 66.2 percent of industrial air pollution. Among these 36 metropolitan areas, Chicago (1,815 tracts), Houston (915 tracts) and Detroit (611 tracts) rank as the highest in terms of total tracts, while six other smaller metropolitan areas count all of their tracts in the most polluted quartile.<sup>5</sup> These descriptive findings illustrate the profound inequalities in exposure to toxic air, especially how these inequalities are shaped by the metropolitan area in which one resides.

[Table 1 about here]

The United States generally has high rates of adherence to Christian faith traditions, but these rates, however, vary greatly across metropolitan area and by the type of religious organization. The average percentage of religious adherents in a metropolitan area is 42.7 percent. Variation is apparent, though, as a metropolitan area at the 25<sup>th</sup> percentile of religious adherents has a rate of 34.6 percent compared to 50.5 percent at the 75<sup>th</sup> percentile. The differences across metropolitan areas for each type of religious organization are even larger than those for the total number of adherents. For conservative Protestants, the interquartile range is from 26.4 percent of the population to 10 percent. This range is almost four times higher for Catholics (21.8 percent to 6 percent) and twice as high for Mainline Protestants (10.8 percent versus 4.9 percent). In

all, these descriptive statistics about religious adherence show wide variability across metropolitan areas.

### *Multilevel Analysis*

Model 1 in Table 2 investigates the proportion of religious adherents alongside key tract and metropolitan measures. Model statistics indicate that the spatial multilevel model approach with a metropolitan level lag is appropriate. The intra-class correlation (ICC) for Model 2, for example, is 0.76. This indicates that a majority of the variation in the dependent variable can be explained at the metropolitan level. For the specific case of industrial air pollution from large facilities, this strikingly high ICC suggests that there are greater inequalities between metropolitan areas than between tracts. The strength of the  $\lambda$  coefficient in Model 1 (and other models) indicates that there is a strong degree of autocorrelation in the data such that the six nearest metropolitan areas share a similar pollution profile with a given metropolitan area.

[Table 2 about here]

In Model 1, the total number of religious adherents is positively associated with more toxic air. This means that a higher proportion of the total of conservative Protestants, Mainline Protestant, and Catholic adherents in a metropolitan area is correlated with greater health risks from industrial pollutants for tracts within that



metropolitan area. A one standard deviation increase in the composite measure for adherents is associated with a 0.23 increase in the predicted logged toxic concentration. This effect size, though, is not particularly large compared to other covariates and other relationships described in models below.

Model 2 includes the same independent covariates as Model 1, but replaces the composite religious measure for three separate measures of the proportion of conservative Protestant, Mainline Protestant, and Catholic adherents. The goal is to assess whether the finding for overall religious adherence holds across different types of faith traditions. Findings from Model 2 illustrate how the composite measure may have masked variation in that the associations depend by the type of religious organization under consideration. Specifically, the main effect for conservative Protestant adherents is positive and large, while it is small for the other two groups, and negative for Catholics. Controlling for neighborhood attributes and the metropolitan spatial, political, racial, economic, and regional contexts, tracts are exposed to greater health risks from industrially produced toxic air in metropolitan areas with a greater proportion of conservative Protestant adherents. Urban areas with more Catholic adherents or Mainline Protestant adherents do not exhibit an effect of comparable magnitude. These contrasting findings indicate that the relationship found in Model 2 for the overall proportion of religious adherents in the metropolitan population is primarily driven by the presence of adherents of conservative Protestant faiths.

Figure 1 showcases this relationship in depth by calculating predicted effect sizes of the toxic concentration variable in Model 2 at percentiles of each of three religious affiliation measures. One relationship stands out. The change in the predicted value of toxic concentration is much greater for conservative Protestant adherents than for members of Mainline Protestant and Catholic congregations, thereby illustrating the findings in Model 3. Holding all other variables constant, for every ten percent increase in proportion of conservative Protestant adherents, we would expect the logged toxic concentration values for tracts within that metropolitan area to be 0.88 higher. As Figure 1 shows, this means that a metropolitan area at the 75<sup>th</sup> percentile in terms of conservative Protestant adherents would have a predicted logged toxic concentration value that is 1.43 higher than a tract in a metropolitan area at the 25<sup>th</sup> percentile; this difference is equal to about half of one standard deviation of the dependent variable. This same calculation for Mainline Protestants would yield a much lower difference (0.1), and it would be negative and very small for Catholics (-0.14). This figure, then, showcases the particularly pivotal association between conservative Protestant adherents and industrial air pollution, and adding nuance that relationships differ depending on the religious group under examination.

[Figure 1 about here]

These findings relating to religious context occur net of important covariates, particularly tract-level racial composition, metropolitan residential segregation, proportion of Republican voters, and region. The association between proportion of black or Hispanic residents in a census tract and industrially produced toxic air is positive indicating evidence for racial inequality across neighborhoods in the United States. At the metropolitan level, residential segregation is positively associated with higher levels of industrial pollution in all models. This effect size is substantial, as a metropolitan area at the 75<sup>th</sup> percentile in residential segregation has a 0.66 higher predicted effect size than one at the 25<sup>th</sup> percentile. This effect size is sizeable but smaller than the finding for conservative Protestant adherence, thereby finding greater support for the substantive relationship between conservative Protestants and industrial air pollution.

Relating to political contexts, the proportion voting Republican in the 2008 presidential election is not especially associated with industrial pollution. The effect for proportion Republican is negative in all models. The effect size is approximately -0.2 for a comparison using data from Model 2 to evaluate differences between the 75<sup>th</sup> percentile and 25<sup>th</sup> percentile of metropolitan areas for this characteristic. This variable is partly distorted by the religious adherence measure, as a supplemental model (not shown) with no religious covariates shows that the association is positive (i.e. more Republican voters is associated with greater industrial pollution) and moderately sized, with an effect size of 0.32 for the difference in the interquartile range of proportion Republican. Taken together, the measure for conservative Protestant adherence has a much greater effect than that for proportion Republican.

Results for religious adherence are also robust to the inclusion of regional controls. For census regions in Models 1 and 2, tracts in the Midwest tend to be more polluted and those in the West tend to be less polluted compared to tracts in the East. The positive association evinced for the South in Model 1 is reversed to a negative effect in Model 2 that uses the decomposed measure of religious adherence. This suggests that conservative Protestants may be partly correlated with presence in the South, and thereby confirms the importance of controlling for region.

These findings also hold when accounting for two important robustness checks in Models 3 and 4 that are otherwise similar to Model 2 except for changes in the conceptualization of the regional variable. First, Model 3 uses a measure for nine EPA regions instead of four census regions, following previous research that findings environmental disparities across EPA regions (Ard 2015). Holding this regional context constant, the findings for the sub-groups are substantively similar as conservative Protestants remains highly associated with industrial pollution, and Catholics and Mainline Protestants retain small effects (the latter of which sees the coefficient switch signs in Model 3). Second, Model 4 uses a different conceptualization of region that conceives of region as binary to determine tracts that are in the South or elsewhere, given that conservative Protestants are more present in the South. The effect for the South is moderate and negative, and all religious adherence findings remain similar to Model 2, most notably that conservative Protestants are strongly linked to industrial air pollution.

## DISCUSSION AND CONCLUSION

Religion is at the core of American civic life, fostering important social ties interrelate with social inequalities (Emerson, Korver-Glenn and Douds 2016; Paxton 2007; Putnam 2000; Wilde and Glassman 2016; Wuthnow 1999). Little research, however, has connected religion to inequalities in exposure to pollution, despite these apparent connections through community and inequality as well as the important theoretical roots from Max Weber (2002) and Lynn White (1967) that suggest such a relationship. At the same time, an emergent area of research focuses on disparities in industrial pollution across metropolitan areas, but without a guiding theoretical framework about what conditions these inequalities. By investigating measures relating to religious adherence, this research integrates religion with environmental justice research to better elucidate the processes that contribute to metropolitan inequalities in industrial air pollution, and, more broadly, to initiate research concerning connections between environmental degradation and religion.

The results mostly support theoretical perspectives on the interrelation of religion and environmental degradation. One primary finding is that the composite measure of conservative Protestant, Mainline Protestant, and Catholic adherents is positively associated with industrial pollution. While this effect is not particularly large, the aggregate effect webs of ties and cultural worldviews as measured through adherents in religious organizations links to negative environmental externalities in the form of industrial emissions. This novel finding affirms the importance of analyzing the religion-environment nexus by extending insights from Weber (2002) and White (1967) to a quantitative, large-scale study of environmental degradation.

Decomposing these measures, however, yields differential findings depending on the religious group being studied. Urban areas with more conservative Protestant adherents are associated with higher levels of industrial pollution. The finding for conservative Protestant adherents suggests that the anthropocentric religious worldviews, diffusion of free market ideologies and greater insularity of social ties that are found with these organizations implies a collective disinterest in deterring pollution and the encouragement of economically productive industrial polluters. Further, it is contradistinction to research that finds a growing stewardship model of the Earth among conservative Protestant (Wilkinson 2012; Danielson 2013); if such trends are afoot, they are not substantive enough to alter historically rooted levels of industrial air pollution. These findings about conservative Protestants stands mostly opposite the findings for Catholics and Mainline Protestants, where little relationship was found. In all, decomposing the religious affiliation measures shows that the primary component of the positive correlation between religious adherents and exposure to industrial pollution is the number of conservative Protestant adherents—and not Catholics or Mainline Protestants.

These findings have theoretical implications for the study of the environment and religion, and for the polluting creed that buttresses industrial air pollution in metropolitan areas. They show the utility of building on individual-level research that primarily focuses on environmental attitudes by using that research to make the case for a connection between religious ecologies and pollution. More than this, the findings here closely parallel those of individual-level research on environmental beliefs, as

conservative Protestants tend to have less environmentally friendly beliefs compared to others. It also renews the historical roots between the two areas of research by highlighting how cultural beliefs operating through religion can facilitate environmental ills (Foster and Holleman, 2012; Weber 2002; White 1967).

This study further theorizes that the three elements detailed – about religious worldviews, adherence to individualist ideologies, and about the nature of social ties – comprise the crux of the connections between religion and environmental degradation, and contribute to a polluting creed in a metropolitan area. Building on ideas about moral communities (Lee and Bartkowski 2004), religious and public subcultures (Olson 2019), place tradition (Molotch, Freudenberg, and Paulsen 2000), and the closed community thesis (Blanchard 2007), these findings together aver that the way in the religious backdrop of a metropolitan area is comprised is linked to dramatically different socio-environmental contexts. An implication is that these three elements in combination underwrite local politics, civic contexts, and relationship between industry and people in a metropolitan area. Following Weber (Foster and Holleman 2012; Weber 1920), a theoretical proposition from this study is that there may be a process of cultural refraction between environmentally toxic industry and place that intertwines both into a polluting creed that conditions action on environmental inequality.

This study has limitations which promote possibilities for future research. The first and primary limitation is this study's use of cross-sectional data, and therefore the study is careful about causal claims. The theoretical framework in this article, such as the

three elements connecting religion and the environment, is not directly tested, as the specific views of individuals or the actions of organizations are not specifically analyzed. Rather, rates of religious adherence are the conceptualization for these elements. A related limitation concerns the idea of the polluting creed, and future research, especially qualitative research, might consider the specifics of ideas that comprise a polluting creed, an articulation that this study's quantitative design about the proportion of adherents is unable to uncover. This research could discuss not only the directionality between environment and religion relationships, but also their composition, particularly by examining the three elements outlined here.

A second limitation is that this study has primarily focused on industrial air pollution, but leaves aside discussion of other pollutants such as those from transportation or household sources as well as land-based pollution and water pollution. Other types of pollution – such as vehicular air pollution, for instance – may not vary as considerably across metropolitan areas, and extending this framework can yield extensions to the present work. Third, this study has not accounted for industrial pollution from medium and small facilities that can emit dangerous emissions (Frickel and Elliott 2018). Fourth, this article discusses the three largest families of denominations in the United States today, but does not analyze the diverse faith traditions outside of these types nor does it consider variations within each of the three types (such as among conservative Protestants; see Blanchard et al. 2008). As other research attests (Danielson 2013; Jenkins and Chapple 2011; Wilkinson 2012), there is denominational variation in interpreting the environment, and re-conceptualizing organizations beyond denominational lines (and



counts of adherents) could add nuance. Moreover, this study is limited to the U.S. Relationships between religion and environment are likely to vary significantly across countries (Hagevi 2014). Finally, these extensions might consider how the presence of religious adherents, especially conservative Protestants, may culturally amplify structural risks associated with pollution such as residential segregation, social inequalities, and manufacturing economies.

How religion is linked to environmental degradation is a longstanding site of social science research. This article moves this research forward from attitudes to observed levels of environmental degradation by finding that different types of religious organizations are associated with health risks in rather different patterns. These findings indicate that what we believe is yoked to what we breathe.

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## ENDNOTES

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<sup>1</sup> The term “Conservative Protestants” is used instead of “Evangelicals” in an attempt to be inclusive of differing denominations that might not consider themselves Evangelicals (for more, see Smith 2000).

<sup>2</sup> While some religious ecology studies – including this one – analyze affiliation using adherence levels (e.g. Beyerlein and Hipp 2005), some other studies instead measure organizational density (e.g. Blanchard 2007). Both are available using the RCMS data. This study uses religious adherence over congregational density to focus on how individual viewpoints accumulate in metropolitan areas. Findings using congregational density measures are substantively similar to adherence. Conservative Protestant congregational density is positively associated with industrial pollution, although the effect size is somewhat smaller than adherence. For Catholic and Mainline Protestant congregations, effects remain small and directionality of the relationships are the same.

<sup>3</sup> Supplemental results (not shown) find that higher rates of black Protestant adherence is associated with higher levels of industrial air pollution when not including the metropolitan measure for proportion minority (for reasons of collinearity). Coupling these two findings, this suggests that any relationship between black Protestants and industrial pollution levels may be spurious and that the operable relationship relies more on the overall racial composition of the urban area.

<sup>4</sup> The DIC for models comparable to Model 2 in Table 2 for a distance-based matrix of 316 kilometers (the smallest radius that each metropolitan area has one neighbor) and for *k*-nearest neighbors of 25 had slightly larger values, but substantively similar, DIC values

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(i.e. a difference less than 5). Results of all models that use a spatial lag with each of these weights matrices are similar to the findings in this article.

<sup>5</sup> These six metropolitan areas are: Anniston-Oxford (AL), Blacksburg-Christiansburg-Radford (VA), Kokomo (IN), Lebanon (PA), Muncie (IN), and Rockford (IL).



**Table 1.** Coding, mean, and standard deviation of study variables.

<u>Variable</u>	<u>Coding</u>	<u>Mean</u>	<u>SD</u>
<b>Tract Level</b>			
Toxic Concentration	>0.01 to 30,600,000 (pounds of pollutants indexed to toxicity of chemicals)	8,821.49	140060.9
Toxic Concentration, Logged	-17.47 to 17.24 (pounds of pollutants indexed to toxicity of chemicals)	6.89	2.48
Prop. Black and Hispanic	0.002 to 1	0.33	0.3
Median Household Income	2.49 to 250	58.45	28.48
Prop. Manufacturing Workers	0 to 0.66	0.1	0.07
Prop. Owner-Occupied Homes	0 to 1	0.63	0.23
Population	105 to 37,452	4,359.17	1989.48
<b>Metropolitan Level</b>			
Prop. Black and Hispanic	0.02 to 0.96	0.24	0.17
Median Income (in thousands)	31.26 to 86.29	48.83	8.2
Residential Segregation	-0.15 to 0.89 (Global Moran's I with possible values from -1 to 1)	0.52	0.21
Prop. Vote Republican in 2008 Presidential Election	0.09 to 0.78 (proportion of voters who voted for John McCain in 2008 Presidential Election)	0.5	0.12
<b>Census Region</b>			
East	12.4% of metropolitan areas		
South	40.5% of metropolitan areas		
Midwest	25.9% of metropolitan areas		
West	21.2% of metropolitan areas		
Prop. Total Adherents	0.02 to 0.91 (proportion of total population that are adherents of Evangelical, Mainline Protestant or Catholic congregations)	0.43	0.12
Prop. Catholic Adherents	0.01 to 0.53 (proportion of total population that are adherents of Catholic congregations)	0.15	0.12
Prop. Evangelical Adherents	0.005 to 0.62 (proportion of total population that are adherents of Evangelical congregations)	0.19	0.13
Prop. Mainline Protestant Adherents	0.0009 to 0.31 (proportion of total population that are adherents of Mainline Protestant congregations)	0.08	0.05

Sources: 2010 Census; 2006-2010 American Community Survey, 2010 Risk-Screening Environmental Indicators Geographic Microdata; 2010 Religious Congregations and Membership Study; 2008 Presidential General Election Results Population: 58,781 census tracts. 363 Metropolitan Areas.

Note: Tract-level variables are group-mean centered, metropolitan-level variables are grand-mean centered, and all are shown in this table before those transformations.

**Table 2.** Regression Results for Multilevel Analysis of Tract-level Toxic Concentration in Metropolitan U.S.

	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
<b>Tract Level</b>				
Prop. Black or Hispanic	1.14 *** (0.03)	1.14 *** (0.03)	1.14 *** (0.03)	1.14 *** (0.03)
Prop. Owner-occupied Homes	-1.26 *** (0.03)	-1.26 *** (0.03)	-1.26 *** (0.03)	-1.26 *** (0.03)
Prop. Manufacturing Workers	1.91 *** (0.1)	1.91 *** (0.1)	1.91 *** (0.1)	1.91 *** (0.1)
Median Income (in thousands)	0.01 *** (0.00)	0.01 *** (0.00)	0.01 *** (0.00)	0.01 *** (0.00)
Population, in thousands	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)
<b>Metropolitan Level</b>				
Census Region (East ref.)				
South	0.87 * (0.37)	-0.85 (0.67)		
Midwest	0.98 ** (0.37)	0.11 (0.42)		
West	-1.04 * (0.46)	-0.98 (0.53)		

Median Income (in thousands)	-0.01 (0.01)	-0.00 (0.01)	0.00 (0.02)	-0.02 (0.01)
Prop. Black or Hispanic	-1.34 (0.97)	-0.49 (0.85)	-0.52 (0.99)	-1.62 * (0.74)
Residential Segregation	2.34 *** (0.63)	2.13 *** (0.58)	1.9 ** (0.7)	2.57 *** (0.56)
Prop. Republican Vote	-0.06 (1.19)	-1.19 (1.48)	-1.13 (1.76)	-1.41 (1.36)
Prop. Religious Adherents	1.89 (1.47)			
Prop. Conservative Protestant Adherents		7.82 *** (1.66)	8.77 *** (2.08)	8.22 *** (1.44)
Prop. Mainline Protestant Adherents		4.76 (3.78)	2.55 (2.91)	5.79 * (2.43)
Prop. Catholic Adherents		-0.86 (1.1)	0.58 (1.45)	1.19 (1.54)
EPA Regions			✓	
South (non-South, ref.)				-0.69 (0.39)
Lambda ( $\lambda$ )	0.51	0.5	0.53	0.51
Intra-Class Correlation (MSA)	0.76	0.75	0.75	0.76
Level-1 <i>N</i>	58,781	58,781	58,781	58,781
Level-2 <i>N</i>	363	363	363	363

	19910			
Deviance Information Criterion	5.2	199104.8	199104.9	199098.8

Note: In Model 3, the eight dummy variables are not shown for reasons of parsimony, but are included as controls.

Figure 1: Predicted Effect Size on Toxic Concentration by Percentiles of Religious Adherents

