

**Scientific Communication about Biological Influences on Homosexuality and the Politics of
Gay Rights**

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ABSTRACT

In recent decades, Americans' thinking regarding the causes of human behavior has changed considerably. In particular, there has been a swing toward attributing a variety of behaviors to biological factors, and perhaps nowhere is this more evident than for sexual orientation. In this article, we draw on two overtime survey datasets to argue that new scientific evidence on the biological bases of homosexuality in the 1990s rapidly changed commonly held beliefs. However, because these scientific explanations were perceived to be relevant to gay rights, persuasion tended to be conditioned on citizens' political values. In short, liberals were considerably more likely than conservatives to embrace biological attributions for homosexuality during this period. Further, these changing—and diverging—causal beliefs about homosexuality appear to have contributed to both increasing support for, and left-right disagreements over, gay rights.

Keywords: Gay rights; biological attribution; political ideology; motivated cognition; public understanding of science; public opinion

In recent decades, scientists have acquired a tremendous amount of knowledge regarding how biological phenomena—including genes, hormones, and neural structures—influence human characteristics and behaviors. This includes *political* scientists who have focused on how biology shapes political attitudes and behaviors. In this article, we connect politics to biology from a different perspective. We ask: How do biological explanations for human traits and conduct available in the information environment intersect with the public’s political opinions? We argue that, generally speaking, biological attributions for human difference are highly relevant to ideological debates, which frequently depend heavily on varying beliefs about individual responsibility, blame, and the potential for change in response to intervention. For this reason, the public’s biological attributions not only influence their political opinions but are also influenced *by* their political opinions.

We focus in this article on political opinion associated with biological attributions for homosexuality.¹ We do so for several reasons. First, in the U.S., there is considerable interest in the causes of homosexuality, and this topic has received much attention in the American mass media for a number of decades. This ensures not only that we are studying a subject of public interest, but also that there will be enough historical public opinion data available with which to study it. Second, scientific beliefs, and accompanying media messages, regarding the causes of homosexuality have changed markedly over the years.

¹ We focus on homosexuality to the exclusion of other sexual orientations (including heterosexuality) because of its salience in public debates over sexuality. We do not mean to imply that explanations for other sexual orientations and gender identities are unrelated, unimportant, or without political relevance.

The most significant recent change was in the early 1990s, when there was a sudden shift among scientists toward biological explanations for homosexuality. This salient change in elite attributional thinking allows us to assess the impact of a changing information environment on public beliefs and attitudes.² Third, social scientists have uncovered strong correlations between what Americans perceive the causes of homosexuality to be and their views on gay rights but have thus far disagreed over the reasons for that correlation.

We put forward a set of expectations regarding public responses to changing media messages regarding the causes of homosexuality. We expect that scientists' and the media's shift in the 1990s toward biology to explain homosexuality caused Americans' factual beliefs to shift in accordance, but that the change was heterogeneous, with liberals being more likely than conservatives to adopt a biological attribution. We argue, further, that these new beliefs pushed liberals further left on gay rights while conservatives' stance on gay rights was reinforced by a continued rejection of the "born gay" narrative. These expectations are tested, and supported, with data from two overtime public opinion datasets.³

² We follow convention in the public opinion literature by distinguishing between beliefs, i.e., perceived facts about the world, and attitudes, i.e., evaluations of objects (e.g., see Lodge and Taber 2013).

³ The eight surveys used in our pooled time-series cross-sectional dataset are available from the Roper Center at www.ropercenter.uconn.edu via the following files: USLAT1983-071, USLAT1985-101, USAIPOCNUS1993-422003, USWASH1998-WPH006B, USLAT2000-442, USPEW2003-10NII, and USLAT2004-501. The 92-93-94 American National Election Study panel study is available at the American National Election Study's website at

The theoretical framework and findings contribute to several lines of research. First, we leverage extensive, overtime data to inform debates over the causal relationship between biological explanations for homosexuality and gay rights support, arguing that causation runs in *both* directions (political opinions both influence, and are influenced by, biological attributions for homosexuality). Second, and related, we contribute to a growing literature that seeks to understand the dynamic nature of public opinion on gay rights, in particular the marked increase in support for gay rights in recent decades (e.g., Flores 2015). Third, we contribute to an emerging “politics of science” literature that examines the causes and consequences of the public’s politically biased reception of scientific knowledge (Suhay and Druckman 2015) but that has thus far paid scant attention to public beliefs about the role of genetics in creating human difference. We discuss these connections and contributions further in the Discussion and Conclusion.

POLITICIZED SCIENCE, MOTIVATED COGNITION, AND IDEOLOGICAL POLARIZATION

The Political Implications of Causal Attributions

Causal explanations for a variety of problematized human characteristics and behaviors—such as poverty or violence—are empirically linked to political preferences (e.g., see Iyengar 1991; Skitka, Mullen, Griffin, Hutchinson, and Chamberlin 2002; Weiner 1995). These political associations can be traced to three perceived properties of causal attributions: locus, controllability, and stability (Weiner, Osborne, and Rudolph 2011).

http://www.electionstudies.org/studypages/anes_mergedfile_1992to1997/anes_mergedfile_1992to1997.htm.

Research on the political implications of causal attributions has thus far focused on locus—whether a cause is internal (i.e., personal) or external (i.e., situational)—and has consistently found an association between internal attributions and conservative policy preferences and, likewise, external attributions and liberal preferences (e.g., Iyengar 1991; Skitka et al. 2002; Weiner 1995). Internal attributions fit a conservative, laissez-faire framework that emphasizes personal responsibility, whereas external attributions, such as inferior schools or discrimination, fit liberals’ preference for government intervention to address societal problems.

This neat internal/external categorization and its political implications are complicated however by a special type of internal attribution: biological causes. Internal causes tend to evoke judgments of responsibility mainly because they suggest that the second property of attributions (controllability) also holds. It is an individual’s *perceived control* over a negative outcome that causes him or her to be held responsible for it. However, biological causes, particularly genetic ones, are understood by the public to be deterministic—i.e., as denying the individual control (Dar-Nimrod and Heine 2010; Weiner 1995).⁴ Thus, *biological* internal causes reverse the usual relationship: If conservatism is often associated with blame and liberalism with sympathy (Skitka and Tetlock 1993; Tetlock and Mitchell 1993), then, all else equal, liberals should be more likely than conservatives to make biological arguments.

The third property of causal attributions, stability, also has political implications. If a characteristic or behavior is thought to be stable over time (as, for example, “genetic”

⁴ When we describe a commonly held belief, it is not our intention to communicate anything about its correctness. See Dar-Nimrod and Heine (2010) on common misperceptions of genetic influences.

characteristics are perceived to be), one is likely to conclude that change is impossible. Applied to social (or moral) issues, this interpretation of biological causes seem to justify social liberalism—a rejection of a governmental or societal role in enforcing religious or social norms—as intervention is perceived to be futile and perhaps even morally inappropriate (Suhay and Jayaratne 2013).⁵

Media Effects and Political Predispositions

Attribution scholars have developed these ideas without reference to the media environment, for the most part. In our view, this is an oversight. Information environments influence public beliefs (Barabas and Jerit 2009) and causal explanations are no exception (Iyengar 1991; Zaller 1992). Thus, the causal explanation a person applies to a given situation is likely to depend heavily on what causal frameworks are most common in the media and public discourse at the time.

Furthermore, the persuasiveness of media messages containing attributional information is unlikely to be uniform across the population due to biased assimilation (Lord, Ross, and Lepper 1979; Munro et al. 2002), i.e., individuals' greater likelihood of accepting information and arguments that justify their existing beliefs and values relative to information and arguments that undermine their beliefs and values.⁶ This is particularly likely if such messages are

⁵ Note that, if applied to the economic realm (e.g., income inequality), these interpretations would justify *economic conservatism* (the government should not mitigate economic inequality). This may be why the politics surrounding biological explanations for socioeconomic inequality have been much less favorable for the poor than the politics surrounding biological explanations for homosexuality have been for lesbians and gays.

⁶ Biased assimilation is a specific form of motivated cognition (i.e., when cognitive processes are recruited by the affect system to serve some goal other than the formation of accurate beliefs)

accompanied by media frames that evoke politics or related values (Kraft, Lodge, and Taber 2015). Note that scholarship on biased assimilation suggests that ideological patterns in the acceptance of attributional messages will be most evident among the politically sophisticated—those with substantial political knowledge and cognitive skills—as they tend to be attentive to media, able to recognize political implications, and adept at counterarguing incongruent arguments (Lodge and Taber 2013; Zaller 1992).

Finally, due to their political implications, attributional media messages are not only the subject of motivated cognition but are also likely to be politically consequential. Individuals who shift their causal beliefs—whether in a motivated fashion or not—are likely to update their related political attitudes to bring them better into line with their altered factual understanding of the world (Haider-Markel and Joslyn 2008).

Biological Explanations for Homosexuality in the News

We test this general framework linking causal explanations, media messages, and political opinion by examining shifting beliefs and attitudes related to sexual orientation in the United States. Common explanations for homosexuality have shifted considerably over the years. During most of the twentieth century, scientific and lay explanations focused on environmental causes (such as family dynamics in childhood) and personal choice (Pitman 2011). A few biological studies emerged during the 1970s and 1980s, but the flow of such studies increased exponentially in the 1990s (Burgess 2011; Pitman 2011; Wilcox 2003). At least fifty such

that relates specifically to the processing of informational messages (Kahan 2011; Kunda 1990; Lodge and Taber 2013). The cognitive mechanisms underlying biased assimilation most commonly discussed in the literature are perceived source credibility and the level of scrutiny given to arguments and evidence.

academic studies were published during the 1990s, the most groundbreaking in the first several years of the decade (Wilcox 2003). The two most prominent were by LeVay (1991), who found that gay men had certain neuro-anatomical structures that more closely matched heterosexual women than heterosexual men, and by Hamer et al. (1993), who conducted the first credible scientific study to identify a specific region of the genome associated with homosexuality. Twin and family studies reporting a high heritability for homosexuality were also published during this time period (e.g., Bailey and Pillard 1991).

The American media responded nearly instantaneously, giving prominent coverage to these scientific developments. A new narrative that homosexuals were “born gay” emerged (Burgess 2011; Conrad and Markens 2001; Haider-Markel and Joslyn 2013; Wilcox 2003). In the Supplemental Information, we include a content analysis of relevant coverage in *The New York Times* from 1990-1999. This analysis corroborates other content analyses of biological explanations for homosexuality (see especially Haider-Markel and Joslyn 2013) and extends beyond them by comparing these explanations to competing “choice” and “environment” explanations. Our analysis demonstrates the spike in “biological attribution” arguments in 1992 and 1993 and the dominance of such attributions over “choice” and “environment” arguments.

The U.S. media not only communicated the studies’ findings to a broad audience, but it also explicitly connected the research findings to political issues, particularly gay rights (Conrad and Markens 2001; Wilcox 2003). For example, many media accounts noted that the biological findings challenged the idea that homosexuality was a “lifestyle choice” or that gays and lesbians could be “converted” to heterosexuality. In some cases, American media reports predicted that the “born gay” studies would cause the public to look more positively on lesbians and gays as well as government efforts to support their rights. Some media reports noted that the new studies

were praised by gay rights organizations (although many organizations in fact held more nuanced views) and were doubted or downplayed by gay right opponents. See Conrad and Markens (2001) and Wilcox (2003) for thorough qualitative analyses of the media coverage on this topic. While some media consumers might have drawn these conclusions themselves from reading the original scientific studies without any explicit politicizing, the political and progressive framing of the studies by the media made these interpretations more likely.

Effects of Biological Explanations for Homosexuality

How might this changed information environment affect citizens' beliefs and opinions? First, we have good evidence that straight-forward persuasion, i.e., changing attributional beliefs, occurred. Previous scholars have provided evidence that such change occurred at the aggregate level, with public opinion data showing biological attributions for homosexuality increasing nearly 20 percentage points during the 1990s (Brewer 2008). A complementary 2001 study links these shifting aggregate beliefs to media influence: nearly half of survey respondents reported that their causal beliefs about homosexuality were influenced by the media (Sheldon et al. 2007).

Previous scholarship leaves us less certain, however, of whether those who adopted a biological attribution for homosexuality adjusted their attitudes toward lesbians and gays and gay rights to be in line with their new, more “progressive” attributional narrative. Brewer (2008) does demonstrate that aggregate attitudes toward homosexuality grew considerably more progressive around the same time beliefs shifted toward biology; however, no scholars of whom we are aware have systematically tested the causal claim that—at the *individual* level—these new beliefs were associated with attitude change. Beliefs and attitudes could change simultaneously at the aggregate level without being linked at the individual level. (I.e., one subgroup might have shifted their factual beliefs, while a different subgroup shifted their opinions on gay rights.)

Additional expectations stem from the tendency for people to engage in motivated cognition, biased assimilation specifically. One might expect liberals and conservatives to diverge in their attributional beliefs after the spike in biological media messages due to biased reception of those messages. Note that we focus on biased assimilation among liberals and conservatives instead of Democrats and Republicans because, during the period we examine, these ideological groups were considerably more polarized over gay rights than were partisans (Lindaman and Haider-Markel 2002). Again, some extant evidence suggests this may have occurred. In the U.S. today, gay rights supporters (social liberals) are considerably more likely than opponents (social conservatives) to argue that sexual orientation is rooted in biology, and this correlation has grown over time (see Brewer 2008; Haider-Markel and Joslyn 2008; Lewis 2009; Suhay and Jayaratne 2013). This said, no scholars of whom we are aware have empirically linked this correlation to politically biased responses to new information flows on what causes homosexuality.

Related to our expectation regarding the biased reception of media messages is the expectation that such patterns should be most apparent among sophisticated liberals. Relatively sophisticated liberals should have shifted their attributions more than their less sophisticated counterparts, as they would have been more attentive to media messages and aware of their political implications. This said, differences between more and less sophisticated conservatives are unlikely, as the former would have been likely to resist “born gay” messages and the latter would have been simply unaware of them.⁷

⁷ We do not expect “boomerang” effects. Not only are such effects rare, occurring mainly among those with extreme opinions in the face of provocative oppositional arguments (Lodge and Taber

Finally, in addition to *factual belief* polarization between liberals and conservatives, we expect some political *attitude* polarization due to diverging causal explanations for homosexuality. If liberals were more likely to accept media reports on biological influences on homosexuality than conservatives, then they should have been more likely, all else equal, to shift their attitudes related to lesbians and gays and gay rights in a progressive direction. Again, some previous research bears on this hypothesis. Whitehead (2014) draws on a large 2010 survey to argue that attributional beliefs (born gay/choice) mediate the relationship between political ideology and attitudes toward civil unions/gay marriage. While he examines a different time period and the cross-sectional nature of the analysis weakens Whiteheads' causal claims, his evidence adds to our expectation that acceptance or rejection of the "born gay" attribution played a role in shaping ideologues' opinions on gay rights during the period we study.

HYPOTHESES

Hypothesis 1: The persuasiveness of media messages that homosexuality is in part biological was contingent on American media consumers' political values and sophistication levels.

- After widespread media coverage of new scientific evidence that homosexuality is based partly in biology, liberals⁸ became more likely to argue that homosexuals are "born gay," whereas conservatives' beliefs did not change on average. (H1a)

2013), but also biological attributions for homosexuality were so uncommon prior to the period we examine (Brewer 2008) that boomerang effects would have been highly unlikely.

⁸ Technically, it is *social* liberals who are more inclined to support gay rights than *social* conservatives; however, the available surveys did not allow us to make this distinction. While the

- In the wake of this new evidence, politically sophisticated liberals adopted the “born gay” attribution at a greater rate than their less sophisticated counterparts. (H1b)

Hypothesis 2: Those Americans who believed that homosexuality is largely innate after the initial surge of media reports became more supportive of lesbians and gays as well as gay rights over time.

Hypothesis 3: American liberals’ greater tendency to believe that homosexuality is innate contributed to liberal-conservative differences over gay rights in the United States during the period we examine. I.e., beliefs about what causes homosexuality partially mediate the relationship between political ideology and gay rights attitudes.

DESCRIPTION OF SURVEY DATA

Below, we test these hypotheses with two survey datasets.

The first is a set of pooled cross-sectional surveys fielded in the 1980s, 1990s, and 2000s. We searched iPOLL, an expansive database of public opinion surveys housed at the Roper Center at the University of Connecticut, for every U.S. poll that asked respondents’ causal attributions for homosexuality, ideological self-placement, and interpersonal contact with lesbians and gays from the 1970s through the first decade of the 2000s. Because increases in interpersonal contact are considered to be a potential contributor to beliefs and attitudes related to lesbians and gays (Herek 2003; Lewis 2009), we wanted to be able to control for this variable.

Survey organizations have asked the causal attribution question in numerous ways over the years. Question variants fall into two categories: 1. those asking the respondent’s position on

overlap between social and economic dimensions of ideology has been considerable in U.S. politics in recent decades, any lack of precision will dampen, not strengthen, our results.

what causes homosexuality (answer categories typically include a choice, environmental, and biological option); and 2. those asking the respondent if lesbians and gays can change their sexual orientation. In order to accurately depict historical trends in public opinion on this issue, it was necessary to analyze surveys with similar question wording. We chose the first question variant due to its more direct wording,⁹ giving us eight polls taken in the following years: 1983, 1985, 1993, 1998, 2000, 2003, and 2004. (Two polls were from 2000.) *Note that our key results do not change if we add surveys with the second question variant to our analysis below.*

Survey details and exact wording for the questions on explanations for homosexuality are in the Supplemental Information. We coded the causal attribution questions “1” if a respondent picked the category indicating that people are born gay and “0” if a respondent said otherwise. The other variables included in our models below are dummy variables for liberal and moderate self-identification, contact with lesbians and gays (contact = 1), race (African American = 1), and sex (female = 1) as well as variables for year of birth (reversed and recoded to range from 0 to 1), education (four values ranging from not a high school graduate (0) to college graduate (1)), and partisanship (three-point scale with Republican = 0, Independent = .5, and Democrat = 1).

The second dataset is an American National Election Studies (ANES) panel survey conducted between 1992 and 1996. The particular series of surveys we examine includes

⁹ Haider-Markel and Joslyn (2008) found that over 85% of Americans who believed homosexuals are “born gay” also said they could not change. One of our surveys (a 1998 *Washington Post* poll) included both questions; the correlation was greater than .6, a high degree of overlap.

interviews with the same individuals in 1992, 1993, and 1996.¹⁰ During each wave of the panel study, respondents were asked the same three attitudinal questions regarding lesbians and gays and their rights: a 0 to 100 feeling thermometer measuring affect toward “gay men and lesbians – that is, homosexuals,” a question assessing support for laws to prevent job discrimination against homosexuals (four answer categories from “oppose strongly” to “favor strongly”), and, finally, a question assessing whether homosexuals should be allowed to serve in the U.S. armed forces (four answer categories from “feel strongly” they should not be allowed to “feel strongly” they should be). We combine the two policy questions into a scale to reduce measurement error. The alphas for the two-item policy scale are: .75 (1992) and .69 (1996). In addition, the 1993 survey asked respondents whether they felt homosexuality was something that people choose or a characteristic they cannot change (four answer choices from “feel strongly” that people choose to be homosexual to “feel strongly” that people cannot change). These variables are scored 0 to 1, and progressive attitudes and “cannot change” beliefs receive higher values. See the Supplemental Information for question wording. Finally, note that this survey was conducted during fall 1993, after most of that year’s prominent academic studies on biological influences (including Hamer’s “gay genes” study) had been published.

¹⁰ Panel studies tend to have considerable attrition between waves, and the numbers were greatly reduced by the third, 1996, wave. Ultimately, we are able to analyze responses from the 300 or so participants who remained in the panel through 1996 and answered all questions relevant to our analyses. Given that the ANES is a general purpose political survey and not focused on gay rights, we have no reason to believe attrition would be associated with our variables of interest and thus bias our analyses.

We include a number of additional variables in our panel analyses: political ideology and partisanship are standard 7-point scales, with liberal/Democrat taking on higher values. Race, sex, year of birth, and education are coded as in the previous analysis, although we use a five-point scale for education here. We also include two religious control variables: respondents' attendance at religious services and the extent to which respondents believe the Bible is the "word of God" (greater religiosity takes on higher values).¹¹ Again, variables range from 0 to 1.

RESULTS

Modeling Explanations for Homosexuality across Time

We begin by assessing the first set of hypotheses: whether attributions for homosexuality were more closely associated with political ideology (particularly among the sophisticated) after scientific findings on innate homosexuality were popularized in the early 1990s. Given data limitations, we use education—a reliable and strong predictor of political knowledge—as a proxy for sophistication (see Brewer 2008; Zaller 1994). Drawing on our series of cross-sectional studies, we display the raw percentages of individuals who indicated the "born gay" response over time in Figure 1. The three panels represent percentages of liberals, moderates, and conservatives choosing this option, and these subsamples are divided by education levels.

[FIGURE 1 ABOUT HERE]

The percentage of people adopting the "born gay" belief clearly increased throughout the 1990s. However, whether individuals adopted the newly available attribution for homosexuality appeared to depend on their pre-existing political views as well as their education levels. In the

¹¹ Unfortunately, the ANES panel did not include a measure of contact with gay Americans.

mid-1980s, biological attributions for homosexuality were unrelated to ideology and education levels. As time passed, however, a great many liberals changed their beliefs. This effect is most pronounced among highly educated liberals. The percentage of this group saying “born gay” more than doubled between the 1985 and 1993 surveys and then rose approximately 10 more points between 1993 and 1998, before leveling out. Less educated liberals also became more likely to say that homosexuals are born gay during the time period; however, the response of this group is more muted, particularly among those with only a high school education or less. Among moderates, we see a similar pattern but the shifts are smaller. Finally, conservatives’ aggregate tendency to attribute homosexuality to biology barely changed over time, regardless of education level. The fact that moderates fell between liberals and conservatives in their adoption of the “born gay” narrative suggests that biased assimilation was occurring among both conservatives (who generally resisted the narrative) and liberals (many of whom embraced it).

Although the patterns in Figure 1 support Hypothesis 1, we conduct a multilevel logistic regression analysis with these data to assess the statistical significance of the relationships. Logistic regression is appropriate because the dependent variable only takes on two values (born gay vs. choice or environment). Multilevel modeling is important because it corrects for correlated errors within surveys attributable to each specific survey apparatus and administration, as well as to the time period each survey was fielded. Multilevel regression also allows for random effects by survey.¹² We also want to rule out possible confounds by adding control

¹² Although we only allow for random effects for the intercept (i.e., the DV mean), performing varying slope models leaves the key results below unchanged. See Table S11 (in Supplemental Information), which displays results from an exhaustive “house effects” model.

variables. For example, it is possible that liberals, particularly educated liberals, had greater contact with lesbians and gays during this period—when many were “coming out”—and that, contrary to our hypothesis regarding reception to media messages, discussions with such individuals caused many liberals’ understandings of the causes of homosexuality to shift. Thus, we regressed the “born gay” variable on the following set of variables: dummy variables for liberal and moderate (excluded category is conservative), a dummy variable taking on the value of 1 for surveys conducted during the 1990s and thereafter, education (mean centered), and the interactions of these variables, along with controls for social contact with lesbians and gays, partisanship, year of birth (reversed), sex, and race. See Table 1.

The results support the first set of hypotheses.¹³ During the 1980s, the effect of liberalism on the dependent variable among those with average education levels was near zero ($b_{\text{LIBERAL}} = 0.002, p = .989$). However, during the 1990s and early 2000s, the relationship between liberalism and the dependent variable increased tremendously ($b_{1990*\text{LIBERAL}} = 1.114, p < .001$), suggesting ideologically biased assimilation of media messages. The marginal effect of liberalism during this later time period among those with an average education level was 1.115 (95% CI = .974, 1.257).¹⁴ Moderates also became more likely during the second period to say people are “born

¹³ The model also turns up relationships between the control variables and the dependent variable in keeping with previous research (e.g., Haider-Markel and Joslyn 2008; Lewis 2009). Contact with lesbians and gays, Democratic partisanship, older age, and being female increased the likelihood of making a biological attribution; identifying as African American decreased the likelihood (all $p < .001$).

¹⁴ Marginal effects and confidence intervals calculated following Kam and Franzese (2007).

gay;” in keeping with the biased assimilation framework, the effect is about half that of liberals’ (b_{1990*MODERATE} = 0.635, p < .001).

[TABLE 1 ABOUT HERE]

The transformation of the relationship between ideology and the dependent variable is even more dramatic if we take into account education levels. During the 1980s, higher education levels dampened liberals’ tendency to argue that lesbians and gays are “born that way” (b_{LIBERAL*EDUCATION} = -1.234, p < .001), and the marginal effect of liberalism on the dependent variable among the highly educated was negative (-0.463; 95% CI = -0.095, -0.830). In the later time period, however, this interactive effect reverses (b_{1990*LIBERAL*EDUCATION} = 1.773, p < .001). Among the highly educated in this later time period, the marginal effect of liberalism on the dependent variable is positive (1.318; 95% CI = 1.122, 1.514). In other words, educated liberals were more likely than educated conservatives to say homosexuals are “born gay.” The size of this effect is larger than any other independent effect in Table 1. These shifting beliefs among the highly educated offer further evidence that liberals’ and conservatives’ responses to media messages on the causes of homosexuality were ideologically motivated.

We estimated additional models to check alternate explanations for the patterns observed in Figure 1 and Table 1. First, other scholars have emphasized the role of partisanship, not ideology, in polarization over explanations for homosexuality (Haider-Markel and Joslyn 2013). An interaction between partisanship and education might be driving the observed relationships between ideology and education. Therefore, we added interactions between party, education, and the post-1990 dummy variable to the above model. See Table SI2. The key findings remain

largely unchanged. We do observe that Independents and Democrats became somewhat more likely, on average, to hold a “born gay” belief during the later time period; however, the effects are weaker in terms of statistical significance ($p < .05$) and no interactive effects between party identification and education emerge. Second, religious variables might explain some of the observed patterns. In particular, religious conservatives would have been more likely than others to be exposed to “choice” attributions.¹⁵ If so, political conservatives’ unchanging attributions (in the aggregate) may have been more due to heavy exposure to countervailing messages than to motivated skepticism. Using a slightly different dataset,¹⁶ we added religious conservatism to the model as well as interactions between it and education and the post-1990 variable. Here again, the results with respect to the effect of ideology and its interactions with education and post-1990 were substantively unchanged. In sum, the findings displayed in Table 1 are highly robust.

Finally, we replicate the analysis in Table 1 using a second, independent source—the ANES 1993 survey. See Table SI3. In this analysis, we demonstrate that increasing political

¹⁵ Such narratives were particularly common in socially conservative churches (Brewer 2008; Haider-Markel and Joslyn 2008; Wilcox 2003).

¹⁶ Many of the surveys in our main dataset did not contain measures of religious conservatism. Therefore, we expanded the number of surveys available for analysis by allowing the attribution question to be worded in either of the two ways previously discussed. (Models controlled for question wording differences.) We found a total of nine surveys with measures of religious conservatism—identification as an Evangelical or Born-Again Christian—as well as the other required variables.

knowledge, a better proxy for political sophistication than education (Zaller 1992), is also associated with an increasing link between liberalism and innate explanations for homosexuality.

The Political Impact of Causal Explanations for Homosexuality

We continue our analysis by using the ANES panel data to assess the impact of changing attributions for homosexuality on both feelings toward lesbians and gays and attitudes regarding gay rights (H2). The ANES dataset has several advantages: It was collected during the time period when media messages regarding new scientific evidence for biological influences on homosexuality were at their height and when beliefs and attitudes regarding homosexuality were in considerable flux. It also allows us to assess within-person change over time and includes more control variables than the previous dataset.

Using OLS regression, we model the 1996 value for the feeling thermometer and the public policy scale as a function of 1) the “cannot change vs. choice” variable (measured in 1993), 2) a lagged version of the dependent variables (also measured in 1993), and 3) a number of control variables, including political ideology, partisanship, year of birth (reversed), education, race, sex, religious attendance, and religious conservatism.¹⁷ Including the lagged dependent variable in the model allows us to assess the extent to which believing that homosexuality was *not* a choice in the fall of 1993 is associated with pro-gay attitude *change* between 1993 and 1996.¹⁸ The control variables eliminate possible confounding effects of

¹⁷ The control variables were measured during the 1992 survey because the 1993 ANES study did not include the full complement of control variables.

¹⁸ Substituting the *difference* between the 1996 dependent variable and its 1993 lag for the dependent variable does not change the substantive results.

additional variables, such as education or religiosity, which could have influenced both the likelihood of holding a biological attribution for homosexuality and pro-gay attitude change.

[TABLE 2 ABOUT HERE]

The results are presented in Table 2 above. In each column, the coefficient on the causal explanation variable is positive and statistically significant ($p < .01$), meaning that believing that homosexuality is unchangeable in 1993 was associated with progressive attitude change (i.e. an increase in support for gay rights or positive affect toward lesbians and gays) between 1993 and 1996. The magnitude of the coefficients suggest that going from the bottom (feel strongly choice) to the top (feel strongly cannot change) of the attribution scale results in approximately an 8% to 11% change in the dependent variables. This finding, which supports our second hypothesis, is robust to alternate model specifications. Note that we *also* find that ideology (relative liberalism) is associated with increasing support for gay rights during the 1993 to 1996 period. I.e., controlling for the other variables in the model, liberals and conservatives polarized (in the expected direction) on the feeling thermometer and policy attitude measures.¹⁹

¹⁹ Some readers may be interested in a better gauge of liberal-conservative polarization during this time period. We re-estimated the models in Table 2 without the “cannot change” variable and then plotted the predicted values for the ideology variable (holding other variables constant). These estimates reveal that most of the movement on gay rights was among liberals (increasing about 10% of the scale); however, there are small boomerang effects among conservatives

The Mediating Role of Causal Explanations for Homosexuality

Our final step is to test Hypothesis 3, which represents the joint implications of the first and second hypotheses: Is the relationship between liberal-conservative political ideology and attitudes related to lesbians and gays partially mediated by causal attributions for homosexuality? In other words, have liberals been more in favor of gay rights than conservatives in the recent past in part because of their greater likelihood of believing that homosexuals are “born gay”?

We again draw on the ANES panel data. Using the R Package for Causal Mediation Analysis, we conduct a traditional “model-based” causal mediation test (see Imai, Keele, Tingley, and Yamamoto 2010). We assess whether political liberalism predicts pro-gay attitudes in part due to liberals’ greater likelihood of believing that homosexuality is innate. To do so, we compute the direct effects of ideology measured in 1992 on the dependent variables (1996 attitudes) as well as any indirect effects of 1992 ideology communicated via causal attribution (measured in 1993). We also include standard statistical controls, measured in 1992.

The results are presented in Table 3. In each case, the direct effect is quite large and statistically significant, and the causal mediation effect is substantial (and also significant). The proportion of the total influence of political liberalism on later pro-gay attitudes that appears to be transmitted through the mediating variable is 18.25% in the policy attitudes analysis and 20.77% in the feeling thermometer analysis. Thus, we observe two effects: a larger independent effect, whereby liberalism in 1992 predicted gay rights progressivism in 1996, as well as a substantial mediation effect, whereby about one-fifth of the total positive association between

(decreasing by about 5% of the scale in each case). This may stem from conservatives’ counterarguing of messages on the causes of homosexuality.

political ideology and gay rights attitudes depends on respondents' causal attribution. These results support our final hypothesis, H3.

[TABLE 3 ABOUT HERE]

Recent scholars have debated the appropriateness of such mediation analyses given strong assumptions underlying the models (e.g., Bullock, Green, and Ha 2010; Imai, Keele, Tingley, and Yamamoto 2011). As a pragmatic way of grappling with these criticisms, Imai, Keele, Tingley, and Yamamoto (2011) recommend a test to determine how sensitive mediation results are to violations of the sequential ignorability assumption. This test (again conducted using the R Package for Causal Mediation Analysis) determined that these results are not particularly sensitive to such a violation. A substantial amount (roughly 23% for each model) of the remaining variance in both the mediator *and* outcome equations would have to be explained by a confounding omitted variable (over and above the included control variables) for the average casual mediation effect to be zero. See Figures SI2 and SI3. Also note that the mediation model is robust to alternate specifications. For example, similar mediation results are obtained if gay rights attitudes measured in 1992 are substituted for political ideology.

DISCUSSION AND CONCLUSION

In sum, analyses of two overtime datasets demonstrate that, in the wake of the American media's focus in the early 1990s on biological causes of homosexuality and their progressive implications, public opinion in the U.S. changed in substantial ways. First, an increasing commitment to the belief that homosexuals are born gay was concentrated among liberals in the 1990s, particularly educated liberals. Moderates adopted this belief at a lower rate, while

conservatives appeared to dismiss evidence for biological influences on homosexuality. These patterns suggest that ideologically biased assimilation of scientific communication about homosexuality was occurring among both liberals and conservatives during the period we examine. Second, Americans who believed homosexuality to be innate shortly after the spike in “born gay” messages became more progressive on gay rights over time, suggesting that altered causal attributions contributed to progressive changes in societal attitudes toward lesbians and gays during the 1990s. Third, together, these two empirical patterns appeared to contribute to left-right attitude differences over gay rights during the 1990s.

Some may find reason to question our conclusion regarding ideologically biased assimilation of biological attributions for homosexuality in recently published research that suggests that Americans on the left are *generally* more open to scientific advances than those on the right (e.g., Mooney 2012). If liberals tend to be more open-minded, receptive to science or simply pay more attention to scientific advances than conservatives, this might explain the ideological differences evident in Figure 1 and Table 1. We address this counterargument in two ways. First, when it serves their political goals, conservatives can be more “open minded” than liberals when considering possible causal attributions (Morgan, Mullen, and Skitka 2010), and liberals can be just as guilty as conservatives of resisting scientific findings (e.g., Kahan, Peters, Dawson, and Slovic 2013; Nisbet, Cooper, and Garrett 2015). Second, drawing on survey data conducted by University of Michigan researchers in 2001,²⁰ we were able to test the specific proposition that, relative to conservatives, liberals were more interested in the topic of genetics

²⁰ The data were collected as a part of the Beliefs about and Understandings of Genetics Project (BUG-P). Toby Jayaratne is Principal Investigator.

and more attentive to news about genetics. This large dataset (N = 1200) shows no statistically significant relationship between left-right political ideology and these interest and attention measures. (*Analyses available upon request.*)

Contributions and Implications

Our study sheds light most directly on previous research on causal explanations for homosexuality and their relationship to attitudes toward lesbians and gays. Literature on this subject has uncovered a sizeable correlation between the “born gay” belief and support for gay rights; however, previous empirical efforts to understand the causal relationship between these two constructs have fallen short, mainly due to limited analysis of longitudinal datasets. In addition, this literature has made only tentative linkages between media discussions surrounding biological attributions for homosexuality and public belief and opinion. We address both topics here in an integrated fashion. We demonstrate that, in response to a new, politicized flow of information regarding the causes of homosexuality, American liberals (and, to a lesser extent, moderates) increasingly adopted the “born gay” perspective while conservatives resisted the new information. These changing factual understandings contributed to changing attitudes.

This study joins a growing literature seeking to understand variation in opinion on gay rights, across people and over time. Our study speaks most directly to historical changes during the 1990s, suggesting the “born gay” narrative contributed to increasing support for gay rights, as well as liberal-conservative polarization, during this time period and into the early 2000s. Note that we do not intend to argue that causal attributions for homosexuality were the *only* important influence on public opinion at the time; rather, they likely worked alongside social phenomena studied by other scholars, especially interpersonal contact with lesbians and gays (Lewis 2011) and “parasocial” contact (Garretson 2015, *forthcoming*).

Given the absence of surveys that include all of the variables needed for our statistical models, we unfortunately cannot extend our analyses to the contemporary period. This said, Gallup survey data from 2015 reveal some important similarities and differences with the framework presented herewith. For the first time, a plurality of Republicans²¹ now say homosexuality is a characteristic people are “born with” (40%) as opposed to the result of “upbringing and the environment” (36%). In addition, and also for the first time, a majority of Republicans now say homosexuality is “morally acceptable” (Gallup 2015a). Thirty-seven percent of Republicans support gay marriage (from a low of 16% in 2005) (Gallup 2015b). Democratic belief in the “born gay” explanation *and* support for gay marriage have also climbed in recent years, such that the right-left gap in beliefs about both the causes of homosexuality and support for gay rights remains relatively unchanged (Gallup 2015a, 2015b). On the one hand, these data suggest a continued causal connection between biological attributions and support for gay rights. On the other hand, Republicans’ increasing belief in biological attributions suggests diminished motivated skepticism. Perhaps the “born gay” narrative has dominated mainstream media long enough that some on the right find it increasingly difficult to reject it; recent research on motivated reasoning suggests this is quite possible (Redlawsk and Civettini 2010).

Some may view these trends as evidence that any widespread rejection of biological explanations for homosexuality among scientists or media would threaten gay rights support. We do not believe this is necessarily the case. As previously discussed, the link between the “born

²¹ Breakdowns by political ideology were not available; however, given the greater overlap between ideology and partisanship today than in the 1990s, the ideology-party distinction is less relevant.

gay” explanation and support for gay rights is likely partially rooted in corresponding media frames (and cultural narratives more broadly) (Conrad and Markens 2001). It is worth noting that many in the LGBT community have embraced an alternate understanding of sexual orientation that emphasizes fluidity across the life cycle and downplays biological influences (Diamond 2009). It is very possible that choice or environment explanations, if accompanied by a progressive frame (e.g., emphasizing the importance of freedom of sexual expression), would be processed by the public in a manner similar to the biological attributions discussed in this article—with gay rights supporters being more likely than opponents to accept the message, and with a progressive effect on gay rights support. Additional research on this subject is needed.

The scholarly relevance of this article extends beyond the study of beliefs and attitudes related to sexual orientation and gay rights. In particular, this article joins a formidable list of studies demonstrating politically biased assimilation of scientific knowledge among the public (see, e.g., Druckman and Bolsen 2011; Kahan 2013; Malka, Krosnick, and Langer 2009; Nisbet, Cooper, and Garrett 2015). However, this growing “politics of science” literature has thus far overlooked two related topics at the center of our study: causal attributions for why people differ from one another, and biological attributions specifically. Causal attributions for human characteristics and behaviors are not only relevant to opinion on gay rights, they are also related to opinion on welfare, education, and crime policy, among other topics. And, if history is any guide, *biological* attributions for differences ranging from sexual orientation to socioeconomics to race and gender may be especially linked to political opinion. In our genomic era, biological explanations (both informed and misinformed) are likely to continue to rise. Tracing their relationship to political values and policy preferences will be an increasingly important task.

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TABLES

Table 1: “Born that Way” More Associated with Liberals (Particularly Educated) Over

Time

	Parameter Estimate	Standard Error	Significance
Constant	-2.406	<i>0.127</i>	***
Know Gay Person	0.497	<i>0.048</i>	***
Party ID (Democrat)	0.255	<i>0.062</i>	***
Year of Birth (reversed)	1.153	<i>0.133</i>	***
Female	0.277	<i>0.044</i>	***
Black	-0.518	<i>0.079</i>	***
Education (mean centered)	0.214	<i>0.231</i>	
Moderate	0.007	<i>0.109</i>	
Moderate*Education	0.089	<i>0.306</i>	
Liberal	0.002	<i>0.120</i>	
Liberal*Education	-1.234	<i>0.333</i>	***
Post-1990	0.177	<i>0.114</i>	
1990*Education	0.281	<i>0.274</i>	
1990*Moderate	0.635	<i>0.123</i>	***
1990*Moderate*Education	0.257	<i>0.361</i>	
1990*Liberal	1.114	<i>0.136</i>	***
1990*Liberal*Education	1.773	<i>0.399</i>	***
σ (Surveys)	0.078		
N(Surveys)	8		
N(Respondents)	11,116		
AIC	12576.4		
Log Likelihood	-6270.2		

*Note: Multilevel logistic regression analysis. Dependent variable = belief lesbians and gays “born that way.” @ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed).*

Table 2: Progressive Attitude Change Associated with Belief Homosexuality is Innate

	Feeling Thermometer (1996)	Policy Attitudes (1996)
	Parameter Estimate	Parameter Estimate
	(S.E.)	(S.E.)
Constant	0.033 (0.049)	0.166** (0.063)
Cannot Change Orientation	0.082** (0.028)	0.114** (0.037)
Political Ideology (7-point)	0.152** (0.052)	0.137@ (0.070)
Party ID (Democrat)	0.072* (0.036)	-0.001 (0.047)
Year of Birth (reversed)	0.017 (0.046)	-0.160** (0.060)
Education	0.075@ (0.039)	0.003 (0.050)
African American	0.042 (0.041)	0.072 (0.056)
Female	0.014 (0.021)	0.011 (0.028)
Religious Attendance	-0.024 (0.028)	0.022 (0.037)
Bible Word of God	0.009 (0.038)	-0.006 (0.049)
Lagged Policy Attitudes	N/A	0.612*** (0.049)
Lagged Feeling Thermometer	0.479*** (0.046)	N/A
N	320	303
Adj. R²	0.52	0.58

Note: Ordinary least squares regression. @ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed).

Table 3: Causal Attribution for Homosexuality Mediates Effect of Political Ideology on Attitudes toward Lesbians and Gays / on Gay Rights

Feeling Thermometer (1996)				
	Para. Est.	Lower 95% C.I.	Upper 95% C.I.	P-Value
Direct Effect of Ideology	0.245	0.137	0.354	<0.01
Indirect Effect (via Attribution)	0.056	0.018	0.101	=0.01
Total Effect	0.302	0.190	0.417	<0.01
Percent via Mediation	18.3%	5.6%	35.7%	=0.01
Sample Size	335			
Simulations	1000			
Policy Attitudes Scale (1996)				
	Para. Est.	Lower 95% C.I.	Upper 95% C.I.	P-Value
Direct Effect of Ideology	0.311	0.144	0.481	<0.01
Indirect Effect (via Attribution)	0.082	0.021	0.151	=0.01
Total Effect	0.392	0.226	0.570	<0.01
Percent via Mediation	20.8%	5.5%	42.1%	=0.01
Sample Size	316			
Simulations	1000			

Note: Controls include party, race, gender, education, year of birth, religious attendance, and biblical interpretation. The relevant models are in Tables SI4 and SI5.

Figure 1: Attributions for Homosexuality by Ideology and Education across Time

