Policy-induced belief updating: What can we learn from the extension of marriage rights to same-sex couples?*

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Abstract

We exploit the timing of the legalization of same-sex marriage to identify the impact of legalization on support for same-sex marriage among a representative sample of Americans. Though there is no evidence that legalization induces changes in belief between support and opposition, the strength with which beliefs are held seemingly increases with legalization, in both directions. By extension, legalization increases state-level polarization on this issue by roughly 65 percent of a standard deviation, inducing larger differences in belief across races and education levels.

Keywords: same-sex marriage, public opinion, belief, polarization

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1 Introduction

Over the last 75 years, roughly one-in-six Americans have identified a social issue of some kind as the most-important problem facing the United States (Heffington, Park and Williams, 2017). The issues change, of course, but a significant fraction of Americans routinely identifies social issues as important.[1] Understanding those underlying beliefs is interesting to economists and policy makers alike. However, as beliefs themselves surely facilitate (or frustrate) the integration of policy innovations into society, understanding how they change around changes in policy is fundamentally important.

Though a challenging empirical task, we apply empirical methods to identifying causal relationships to consider what can be learned about belief regarding same-sex marriage around related policy innovations. This turns out to be especially valuable, as we uncover a certain strengthening of individual belief, systematically moving the country toward more-extreme positions, and ultimately increasing polarization. Conditional on those disagreeing with the legalization of same-sex marriage, we find respondents in the General Social Survey are 11.5-percent more likely to "strongly disagree" following state legalization. Likewise, conditional on agreeing with legalization, we find respondents are 21.1-percent more likely to "strongly agree" following state legalization. In the Arrow (1969) sense of transaction costs, we worry about such polarization, as one can imagine the associated costs being "so high that the existence of the market is no longer worthwhile."

Somewhat shockingly, in the last 60 years, differences in the ideological positions of the median Democrat and the median Republican in the U.S. Congress have increased by 53 percent (Poole, 2005). And Americans are themselves increasingly more politically polarized (Center, 2014), with some 92 percent of those who identify as Republican now measurably more conservative (on issues) than the median Democrat, and 94 percent of those who

[1] This fraction has been as high as 74 percent of Americans—largely driven by issues related to abortion and abortion rights, in 1989. Other examples include gender equality, civil liberties, discrimination and racism, same-sex rights, generational issues, crime, religion, and family and related values. In general, the propensity for social issues to displace economic issues is strongly related to booms in the business cycle.

identify as Democrat now more liberal than the median Republican. (Only twenty years ago, these same metrics were 64 and 70 percent.) Among other factors, there is evidence that media-consumption choices influence political beliefs—that exposure to Fox News induces more-conservative belief, for example (Martin and Yurukoglu, 2017; DellaVigna and Kaplan, 2007). We imagine many such contributors to the shaping of belief, of course, and in ways that are likely to influence the society in which we share. Belief in the legal legitimacy of same-sex marriage is one such area—we consider whether innovations in related legal policy play a role in driving belief, and then potentially in increasing polarization of society more broadly.

There are number of other areas where policy variation has been shown to play a role in belief formation. For example, Cantoni, Chen, Yang, Yuchtman and Zhang (2017) considers the effect of a gradual rollout of a politically motivated curriculum change, suggesting that students' political beliefs under the new material more-closely matched beliefs taught under the newer curriculum. Clots-Figueras and Masella (2013) and Friedman, Kremer, Miguel and Thornton (2016) also explore the effect of education on beliefs and suggest a role for curriculum in induced changes in political and social beliefs.[2] Erikson and Stoker (2011) exploits random variation in the Vietnam draft lottery and, after controlling for actual military service, finds that men with lower draft numbers (more likely to be drafted) are more likely to have anti-war opinions and beliefs that are more-in-line with the Democratic Party. Among other examples in the literature, the acceptability of smoking have been linked to workplace smoking bans (Pacheco, 2013), as have beliefs around welfare reform (Soss, 1999; Hetling and McDermott, 2008; Hetling, McDermott and Mapps, 2008; Soss and Schram, 2007), and health-care policy (Gusmano, Schlesinger and Thomas, 2002; Campbell, 2011; Barabas, 2009) been linked to related policy variation.

In this paper, we directly examine individual opinions regarding same-sex marriage, using variation in the timing of state-level legalizations of same-sex marriage to identify

[2] See Alesina and Giuliano (2015) for a summary of the literature on the interaction of beliefs with private and public institutions.

systematic changes in those beliefs—the "policy feedback" effect of same-sex marriage legalization.[3] Others have considered the potential feedback from policy to belief, even around the legalization of same-sex marriage. For example, Flores and Barclay (2016) matches "treated" to "untreated" individuals in the American National Election Study (ANES) around four state-level changes to same-sex marriage (three state-ballot measures in 2012, and the 2013 California legalization). Although they find transition probabilities that suggest increasing support, on average, the ANES lacks the dexterity to identify beliefs beyond broad opposition, support, or "ambivalence." We find more-nuanced response to policy change, that the ANES will necessarily miss.[4] Our analysis will suggest that such restrictions are significant barriers to understanding the underlying dynamics, as there is significant movement evidenced when the survey instrument allows for movements in *strength* of belief. In part, this is exactly the story we find—increasing polarization through increasing strength of both support *and* opposition.[5]

Having identified an induced variation in belief, it is natural to then consider the extent to which policy feedback can lead to increasing polarization, or within-group differences. In the political sphere, for example, decreased legislative productivity and increased political participation and campaign investment have been associated with polarization (Nivola and Brady, 2008; Van Weelden, 2015). In education, the effects of classroom diversity have been

[3] The legalization of same-sex marriage has itself been implicated in several outcomes, in ways that suggest underlying changes in belief or opinion, or in the willingness to act around those beliefs. For example, Harris (2015) suggests that judicial retention and political participation change following same-sex marriage legalization in Iowa—that legalization led to the defeat of justices who ruled in the case, and to increased political participation in subsequent elections. Dee (2008) exploits variation in same-sex marriage legislation in Europe to explain the transmission of sexually transmitted infections—infection rates decreased after legalization, consistent with lower rates of risky sex. In the public-health literature, legalization of same-sex marriage has also been associated with improved mental health among those for which the previous bans might have been most salient (Tatum, 2017; Hatzenbuehler, Keyes and Hasin, 2009).

[4] Regarding same-sex marriage, Flores and Barclay (2016) defines ambivalence toward same-sex marriage as support for civil unions for same-sex couples, but opposition toward same-sex marriage.

[5] Although conditioned on some potential cofounders, there are several studies that lack control-group comparisons (of participants not affected by changes in the legal status), and may well be confounded by increasing average support. Bishin, Hayes, Incantalupo and Smith (2015) collects opinion data on same-sex marriage before and after relevant court rulings, and is unable to detect changes in opinion. Similarly, Kreitzer, Hamilton and Tolbert (2014) cites that public approval of same-sex marriage increased in Iowa after its 2009 legalization.

linked to achievement (Hoxby, 2000; Carrell and Hoekstra, 2010; Hanushek, Kain and Rivkin, 2009). Alesina and Ferrara (2005) summarizes the large literature that has evolved around the relationship between growth and measures of fractionalization or polarization. Ethnic diversity has also been shown to frustrate economic growth. For example, Easterly and Levine (1997) consider cross-country comparisons in finding effects of ethnic fractionalization and economic growth—that higher ethnic diversity contributes to lower economic well-being. The wider literature also includes examples of ethnic diversity and civil war (Montalvo and Reynal-Querol, 2005), genocide (Montalvo and Reynal-Querol, 2008), corruption (Papyrakis and Mo, 2014), and government quality (La Porta, Lopez-de Silanes, Shleifer and Vishny, 1999). In these papers, it is common to attribute slower growth to some combination of subgroups being unable to agree on policy, and increasing aversion toward public-good provision where polarization is high (Alesina and Ferrara, 2005). While we leave the implications or consequences of polarization around same-sex marriage to future work, here, we identify a role for policy changes to act on polarization itself, through what will amount to changes to underlying belief that move toward extremes.

In Section 2, we provide a brief history of same-sex marriage in the US. It is in this section that we provide the necessary context for identifying the effect of policy variation on public opinion and describe our data. In Section 3, we describe our empirical strategy, quickly presenting results of a model of binary support, followed by modeling the five-fold-response variables available in the General Social Survey (GSS). As we suggest above, this will prove informative, and ultimately uncovers what we believe is the fairest assessment of the data on this issue—there is a vacating of weakly held positions in favor or extremes.

2 Background and data

2.1 General Social Survey

Since 1972, the General Social Survey (GSS) has collected the sentiment of Americans on such issues as national-spending priorities, crime and punishment, intergroup relations, and confidence in institutions. The GSS, facilitated by the National Opinion Research Center (NORC) at the University of Chicago, is the main source of data for our analysis, collected almost every year between 1972 and 1994, and every other year since 1994.[6] Although the GSS first asked about beliefs on same-sex marriage in 1988 as a part of an international survey of beliefs, we discard data from that year and only utilize data starting in 2004, when the question became part of the permanent series.[7]

The relevant responses we will track in the GSS are respondent's reflections on the question, "Do you agree or disagree? 'Homosexual couples should have the right to marry one another.'" A standard five-point scale was offered to respondents (i.e., Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, and Strongly Agree), through which we will identify the nuanced movement in belief. In Figure 1, we reproduce the proportions of respondents who select each of the five options across the 2004–2016 time series.[8] Although we will reveal a somewhat more-nuanced story with the data than that of a simple movement of opinion toward acceptance, "average" support for same-sex marriage has indeed increased in the US over the last 12 years. Capturing central tendencies from distributions of opinion is non-trivial. However, note that in 2012 the modal response switches from "strong disagreement" to "agreement," and then to "strong agreement" by 2014.[9] Ignoring strength of opinion, note also that the proportion of respondents who either "agree" or "strongly agree" with legal

[6] For examples of how the GSS has been used, see Bisin, Topa and Verdier (2004), Giuliano and Spilimbergo (2013), Levinson (2012), Keely and Tan (2008), Stevenson and Wolfers (2009).)

[7] The question was asked in 1988 as a part of the International Social Survey Programme (ISSP).

[8] Although we do not consider the 1988 responses to this questions as part of our econometric exercise, in Appendix Figure A1 we do display the long trend.

[9] We note that beliefs on other policies are seemingly trending more slowly, with the exception of inclinations toward marijuana use.

same-sex marriage doubles between 1988 and 2004 (from 12.4 percent to 29.7 percent) and doubles again by 2016 (from 29.7 to 59.3). Clearly, being careful about the role of trends in our empirical specifications will be important.

2.2 Policy variation

With the fundamental interest being the potential change in belief around legalization, we augment the GSS data with publicly available data on legislative and judicial decisions relating to same-sex marriage, at state and federal levels. In May 2004, Massachusetts became the first state to legalize same-sex marriage. Within two years, 23 states had passed constitutional amendments barring same-sex marriages, and by the end of 2012, 31 states had imposed constitutional bans. Meanwhile, still-other states had joined Massachusetts in moving toward legalization, with eight states and the District of Columbia legalizing same-sex marriage by the end of 2012. In 2013 and 2014, a rash of court cases overturned many of these constitutional amendments and, in 2015, the U.S. Supreme Court legalized same-sex marriage nationwide.

In Figure 2, we present the timing and method of legalization across states, noting that much of the early movement is through legislative action to legalize same-sex marriage, either through referenda or state legislation. (Seven of the first ten states that legalized same-sex marriage do so through one of these two methods.) However, most individuals in the US experienced the legalization of same-sex marriage judicially, some through actions taken by their own state judiciary, but many others through federal circuit courts or the U.S. Supreme Court itself. In such cases, legalization is through what is referred to as binding precedent.[10] There is an argument to be made that in being a step removed from local public opinion, imposed legality is in cleaner identification. However, the timing of these—all of them happening between the 2014 and 2016 GSS surveys—does not easily allow for their

[10] A lower court is under a binding precedent when a higher court has established case law that supersedes any potential lower court ruling. In the case of same-sex marriage, this most often occurred when a federal district court overturned a same-sex marriage ban, meaning that any courts under their jurisdiction would need to follow that ruling on any future same-sex marriage bans. This usually resulted in same-sex marriage bans being quickly overturned in states under a binding precedent.

full consideration. As we consider this variation, then, we will knowingly sacrifice power for added exogeneity, and extra care should be taken with the resulting inference.

3 Empirical analysis

3.1 Support for same-sex marriage

In considering the relationship between private beliefs and legalization, we will approach modeling as a difference-in-differences exercise, identifying off of the policy variation induced by the timing of legalization within and across states. In general, then, we will be considering specifications such as,

$$\mathbb{1}(Supportive_{isy}) = \beta \mathbb{1}(Legal_{sy}) + \delta_s + \gamma_y + \epsilon_{isy}, \tag{1}$$

where $Supportive_{isy}$ represents the individual belief of person i in state s in year y. In the GSS, belief is captured on a five-point scale. However, as a first pass, we define $\mathbb{1}(Supportive_{isy})$ as an indicator variable capturing whether the respondent takes the supportive position—that is, either "agrees" or "strongly agrees" with legalizing same-sex marriage. (This allows result to speak back to prior literature, though we ultimately relax this restriction to consider the five-fold responses.) We define $\mathbb{1}(Legal_{sy})$ as an indicator variable, capturing whether same-sex marriage is legal in state s in year y. In addition, we include state fixed effects (δ_s) and year fixed effects (γ_y).

The main challenge to identification we face is to separate the any causal effect of legalization on belief from underlying trends in beliefs associated with other factors. The inclusion of year fixed effects should absorb any changes in national beliefs over time and year-specific idiosyncratic shocks. In our preferred specification, we also include state-specific linear trends to account for differentially trending beliefs across states. In addition, we will consider heterogeneity by the method of legalization, to examine whether patterns are similar

when same-sex marriage is legalized by courts, where one may be more confident in the plausible exogeneity of our identifying variation.[11] We estimate Equation 1 by ordinary least squares, allowing for clustering at the state level as we estimate standard errors. Point estimates can be interpreted as percentage-point changes in the probability of supporting the legalization of same-sex marriage.

In Table 1, we first report estimates directly associated with this baseline specification of Equation (1). In Column (1), we see what broader literatures typically interpret as evidence of causality running from the legalization of same-sex marriage to positive support for same-sex marriage—legalization inducing a 7.2-percent increase in the probability a respondent associates positively with same-sex marriage.[12] However, given the prospect that states that legalized same-sex marriage may be the same states in which belief is trending upward faster, one might be concerned that such an interpretation of the data is not robust to allowing for state-specific trends, for example.

When we allow for state-specific time trends, in Column (2), we see how sensitive any such inference is, with the point estimate on legality attenuating and losing statistical significance. In Column (3), we add individual-level controls, which further attenuates the point estimate on $\mathbb{1}(Legal)$.[13] This exercise suggests that there is little support for a causal claim that legalization brings with it any significant movement between opposition and support.

3.2 Legalization and strength of belief

As restricting responses to agreement/disagreement hides potential movements in the strength of beliefs (and movement of those who do not have a strong opinion either way), we now turn to examining changes in the strength of belief. In Figure 3, we report the implied changes in predicted probabilities across the five categorical responses permitted in

[11] In short, though lower powered, identifying off of legality through binding precedent reveals similar patterns, which we interpret as supporting our identification more broadly off variation in legalization by popular referendum retrieving estimates that justify a causal interpretation.

[12] See Flores and Barclay (2016).

[13] Individual-level controls include age fixed effects, gender, race, employment status, income, religion, and educational attainment

the GSS and the associated impact sizes (given the different belief levels across categories). We derive these estimates and confidence intervals from a single multinomial logit model, which we interpret as the changes in mass at each of the five outcomes coincident with legalization.[14] As before, we include state and year fixed effects, state-specific linear trends, and individual-level controls.[15] As with all such analyses, we are unable to identify where the mass in any one category is likely to have come from in the counterfactual, but only how it has predictively changed. For example, and noteworthy here, we see that the estimated change in the probability that a respondent chooses "strongly agree" is roughly four percentage points higher after legalization. Relative to the underlying propensity to strongly agree among the control group (.213), this represents an impact of roughly 20 percent. Similarly, we see a *decrease* in the predicted probability that a respondent would choose "agree" of about the same magnitude and impact size. (We provide the multinomial logit estimates in Table A1 in the appendix.)

Although not statistically significant, following legalization, individuals are also more likely to respond that they "strongly disagree" with legalizing same-sex marriage, and less likely to respond with "disagree."[16] One interpretation of the data generating process is that mass is moving toward the "tails" of the distribution, in a roughly "U-shaped" manner. However, note also the slight increase in mass in the "Neither agree nor disagree" associated with legalization, as if the data are suggesting more of a "W-shaped" response to legalization. This movement is suggestive of respondents holding their beliefs more strongly in response to legalization. This is also consistent with Table 1, in which respondents do not switch between opposition and support, but move within these categories.

[14] The ordinal logit model is another natural model, but it is not appropriate for this context. The ordinal logit model depends on the "parallel regressions" assumption, which fails to be satisfied here. However, the multinomial logit model can be thought of as a less-restrictive (and less-parsimonious) version of the ordinal logit model.

[15] Estimating a model with only state- and year- fixed effects yields similar results, suggesting that it is the omission of unobserved heterogeneity in strength of beliefs that biases the naive regression, and not the omission of individual characteristics or state-level trends.

[16] The "strongly disagree" effect becomes statistically significant at the 10-percent level when using a less-conservative approach to our errors, when clustering at the state-year level instead of at the state level.

In Table 2, we consider two different binary dependent variables with the intention of informing this notion of U- or W-shaped responses. In Column (1), we ask whether it is more likely that respondents choose either "Strongly disagree" or "Strongly agree," rather than any of the interior categories available. We find a 0.092 increase in the probability that one responds in one of these two ways (an 18.7-percent increase). In Column (3), we then include "Neither agree nor disagree" and ask a similar question—are respondents differentially more likely to choose either position compared the "neither" category after legalization, than they would have been prior to legalization? We find a 0.092 increase in the probability that one responds in one of these three ways (a 14.8-percent increase). With legalization, respondents are 24.2-percent less likely to select the "weakly" held positions of "disagree" or "agree."

3.3 Heterogeneous Responses to Legalization

We next consider heterogeneity in these changes in belief. As age is a important predictor of support for same-sex marriage, it is important to consider the differential effect of legalization across age groups.[17] We explore heterogenous responses to legalization across different age cohorts. We stratify the sample into generations: greatest/silent generations (1915-1945), baby boomers (1946-1964), generation X (1965-1979), and millennials (1980-1988).[18] We report the estimated coefficients and impact sizes from interacting legalization with these generational groups in Figure 4. Note that the same general pattern appears among all cohort groups—there is an increase in the estimated probability that people in each cohort will select the "strong" outcomes and a decreased probability that people will select the "weaker" outcomes. The consistency among these estimates helps alleviate concerns that these effects are being driven by changes in cohort composition over time.

In figures 5 and 6 we report similar systems of estimated impacts, having stratified the sample by education (Figure 5) and race (Figure 6). Notably, we see that it is the more-

[17] The concern that generational concerns may bias results motivates our inclusion of age fixed effects in our main specification.

[18] In our sample, the youngest person surveyed was born in 1988.

educated who are most inclined to *increase* their strong support of gay couples marrying with legalization, and the less-educated who are most inclined to *decrease* their support, though the general "W-shaped" responses are still generally evident across all groups. With respect to race and ethnicity, we again see this "W-shaped" pattern, though note the significant differences between whites, who are 26-percent more likely strongly agree after legalization, and Hispanic respondents, who are 41.6-percent more likely to strongly disagree after legalization. As white and more educated respondents have higher levels of support initially, this represents a divergence in opinion. As a result of the legalization of same-sex marriage, these educational and racial groups have increasingly-different beliefs from each other.

When re-running the initial binary specification with interactions for education and race, some interactions remain statistically significant at the 10-percent level, though precision is lost with the additional demands on the model. In education, a bachelor's degree is associated with a 9.97 percentage point increase and a graduate degree is associated with a 8.39 percentage point increase in the probability a respondent would support same-sex marriage after legalization occurs. In race, Hispanic respondents are 8.74 percentage points less likely to support same-sex marriage and respondents that are of "other" races or ethnicities (i.e. not White, Black, Hispanic, or Asian) are 13.81 percentage points less likely to support same-sex marriage. This suggests that at least some of the movement in this heterogeneity may be due to respondents in these categories switching between opposition and support while others strengthen their beliefs.

Finally, we explore heterogeneity across states with differential beliefs. We stratify states into terciles based on the average belief level of respondents in those states in 2004. We report the estimated effect of legalization on belief for these terciles in Figure 7. The "W" shape is again present across these panels, but notably, the "neither agree nor disagree" estimate is negative in Panel B. This is suggestive of the middle beliefs being emptied in those states.

We perform a similar exercise in Figure 8 by examining heterogeneity by the method of legalization. Again, the general "W-shaped" pattern appears across all three methods,

although the movement is more pronounced in those states that legalized same-sex marriage through popular referendum or state-legislative action (Panel A). However, even among those states under a binding precedent (Panel C), we see similar movement toward the extreme positions of "strongly agree" and "strongly disagree", though estimates are lacking some precision. Being imposed through binding precedent is arguably in the direction of increasing exogeneity, so we interpret this as supportive of a causal interpretation of the estimates we retrieve.[19]

3.4 Failed attempts to legalize same-sex marriage

Given the political environment surrounding the legalization of same-sex marriage, we think it is important to ask whether changes in beliefs are due not to the passage of legislation, but due to the political environment itself. To disentangle the political atmosphere from the passage of the marriage legality, we exploit state-level variation in the timing of failed attempts to legalize same-sex marriage. In these attempts, the media attention, the debate on social media, and the salience of the law passing in one's own state, are presumably similar, with the outcome of the attempt being the only difference, and to that extent facilitate a valid empirical test.

We focus on attempts to legalize same-sex marriage through courts, as the bulk of the policy variation in the successful attempts occurred through the courts.[20] We also focus on failed attempts to legalize same-sex marriage as opposed to successful attempts to ban same-sex marriage in order to keep the environment as similar as possible to the successful attempts to legalize same-sex marriage. We report the list of states with failed attempts (and the corresponding timing of their eventual legality) in Table A2.

In Figure 9, we present the estimated coefficients of a similarly specified multinomial logit

[19]There are no significant interactions in the binary model when examining both heterogeneity in state belief and in method of legalization.

[20] Including other types of attempts does not meaningfully affect the results.

model where we include an indicator variable that captures failed attempts.[21] Across two panels, we report the predicted probabilities for both the original "legal" variable (Panel A) as well as this new "attempt" variable (Panel B). Doing so, we see a distinct lack of the W shape in the failed attempts, with point estimates on $\mathbb{1}(Attempt)$ suggesting a pattern of increasing mass at "strongly agree" and "agree" and decreasing mass in the middle category of "neither agree nor disagree" and in "strongly disagree." Taken together, the movement toward extreme beliefs (in both directions) seems to be tied only to successful attempts to legalize same-sex marriage, and not simply because of the surrounding political and social environment. We believe that it is the legalization itself that matters.

One interpretation of these patterns is that legalization induces a "backlash" of sorts among those who disagree, leading to more-strongly held disagreement when the law goes against their desires (Panel A) than when the attempt to legalize same-sex marriage fails (Panel B). Movement toward agreement is apparent in both legalization and failed attempts to legalize, even controlling for year fixed effects, as though those in agreement are emboldened by both.

3.5 Direct measures of polarization

Given the strong suggestion that belief is held with increasing strength, in Table 3 we consider direct measures of polarization around these state-level changes in legalization. Having some intuitive appeal, in Column (1) we first consider changes in state-level standard deviations of belief induced by legalization. That is, we aggregate our data to state-year observations and run our preferred specification using the standard deviation of beliefs in a given state-year as the dependent variable. Although not statistically significant, we see a 15.1-percent increase in the within-state standard deviation of responses.

In Column (2) of Table 3, we ask directly how polarization moves with legalization. Depending on the situation, there are several different approaches to measure polarization.

[21] We define $\mathbb{1}(Attempt)$ as equal to one if there had been a failed attempt to legalize same-sex marriage previous to respondent i responding to the survey in state s in year y.

For example, earlier in this paper party-level polarization was measured by the difference between the median Democratic position and the median Republican position. In this situation, where participants can select five different choices, we use the Esteban-Ray index of polarization. This index is appropriate here as it incorporates information about both the ordered nature of beliefs and the mass of respondents at each (discrete) belief choice. In this context, this measure is maximized at 1 when 50 percent of the sample is at each extreme and the measure is minimized at 0 when 100 percent of the sample is at one belief choice.[22] It is with this refined measure of polarization that we find a significant increase in polarization directly—with the advent of legalization, the ER polarization index increases by 0.065, or an increase in state-level polarization of 17 percent. This is a large effect, with legalization explaining roughly 65 percent of a standard deviation in state-level polarization. Having identified that this is derived from movement toward more-strongly held belief, we are inclined to suggest that the smoothness of any transition toward support over time may be slowed by this underlying empirical regularity.

4 Conclusion

Over some 25 years, efforts have been made to legalize or ban same-sex marriage, culminating in the 2015 U.S. Supreme Court decision that legalized same-sex marriage nationwide. We exploit the timing of legalization to retrieve an estimate of the effect of legalization on individual belief and state-level polarization.

We find little evidence of legalization inducing people to switch between support and opposition of same-sex marriage. However, we do find movement toward stronger support

[22] Esteban and Ray (1994) define polarization as

$$ER = \sum_{i=1}^{5} \sum_{j=1}^{5} p_i^2 \cdot p_j \left| b_i - b_j \right|$$

where p_i represents the proportion of the sample with belief b_i. In our case, i and j capture the five dimensions of categorical response (i.e., "strongly disagree" through "strongly agree").

and stronger opposition. This pattern is also somewhat concentrated demographically—white respondents are tending to move toward stronger support while Hispanic respondents are tending to move toward stronger opposition. In addition, we see evidence of divergence between educational groups—undergraduate degrees are predictive of increased support around legalization, while legalization predicts less support among less-educated individuals. The imposition of public policy has the effect of strengthening the beliefs one already holds instead of changing those beliefs altogether. Using the Esteban-Ray polarization index to summarize underlying movements in belief, we also document that state-level polarization increases roughly 65-percent of a standard deviation. To the extent that dissimilarity of belief increases transaction costs, the economic costs induced by legalization may be large.

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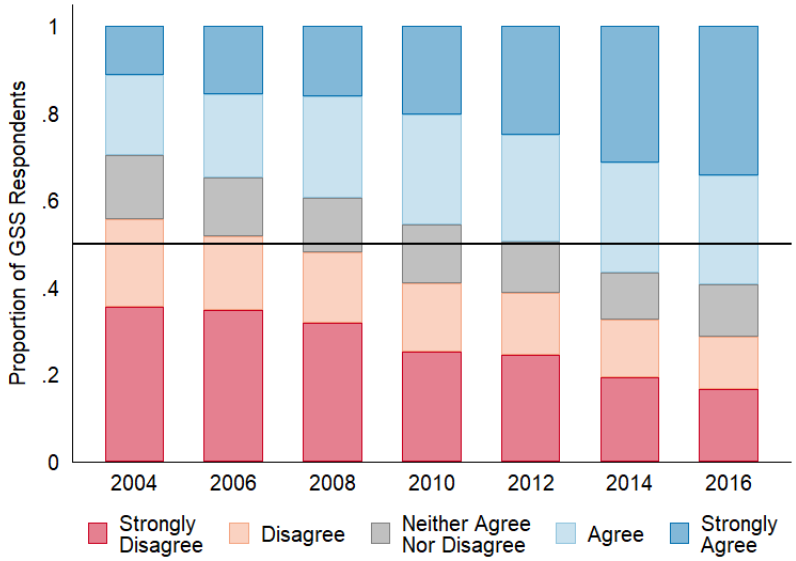
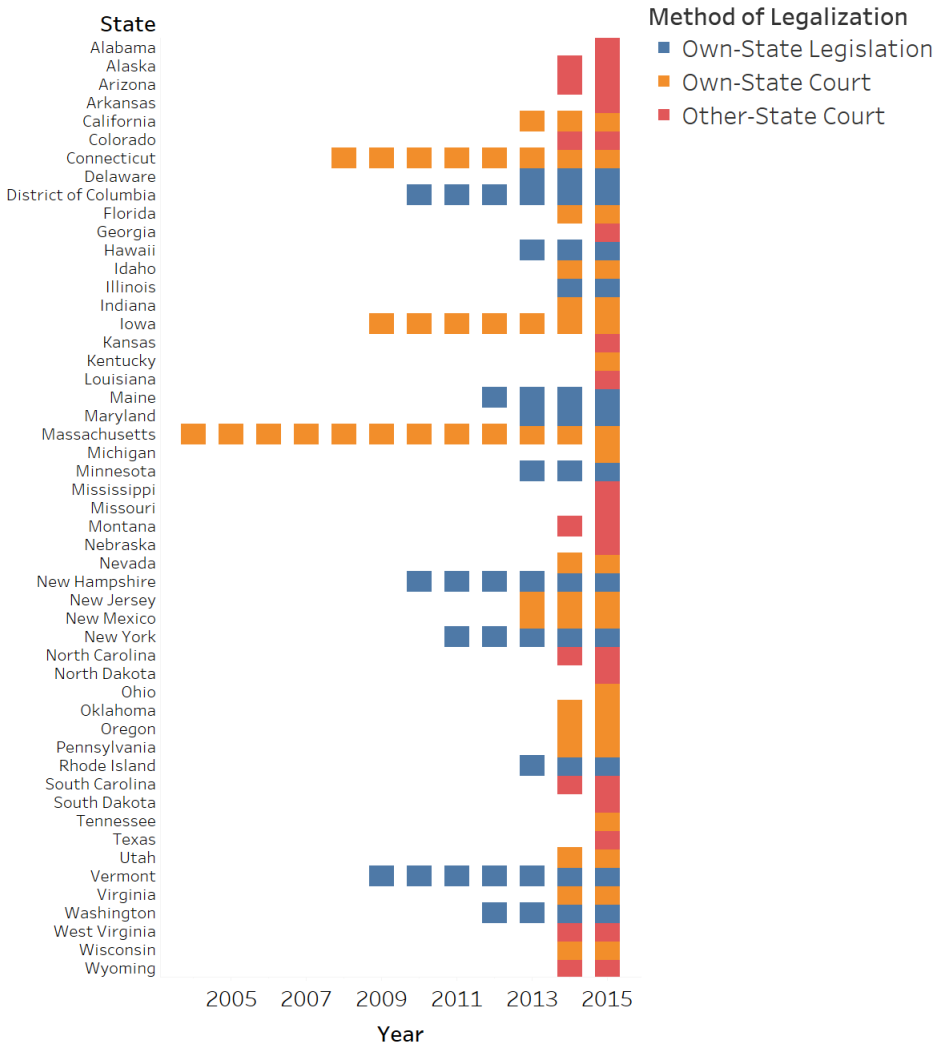
Figures

Figure 1: Responses to "Homosexual couples should have the right to marry one another," 2004–2016



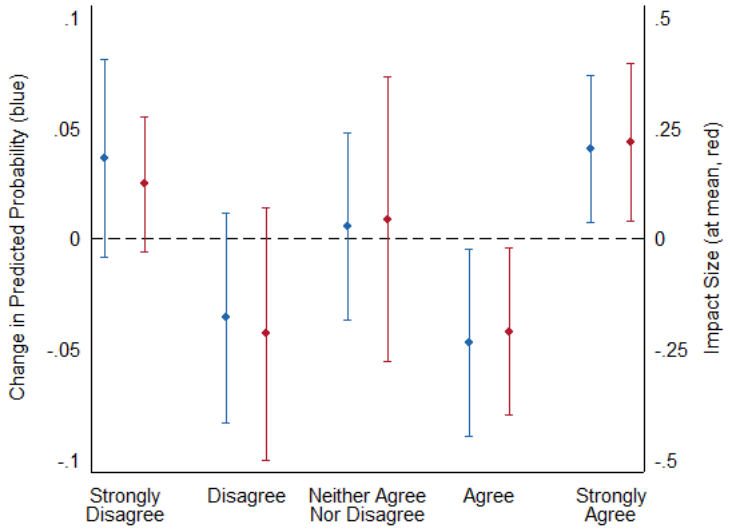
Notes: We plot the proportion of GSS respondents in each categorical response to the GSS question "Do you agree or disagree? Homosexual couples should have the right to marry one another," as fractions of one.

Figure 2: Timing and method of same-sex-marriage legalization, by state



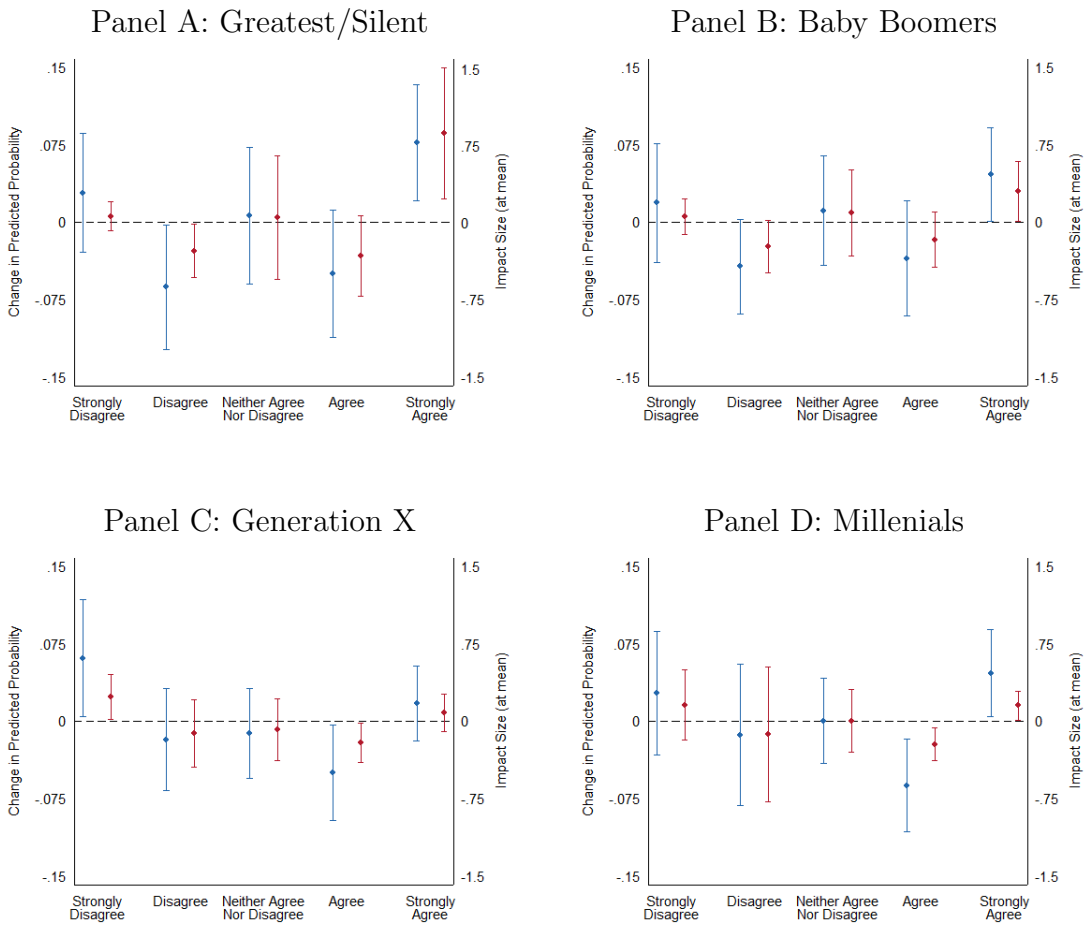
Notes: We present the timing of the legalization of same-sex marriage across states, color coded by method of legalization. We stratify legalization method into three categories: own-state legislation, which includes both legalization by popular referendum and action by the legislative branch; own-state court action; and other-state court action which also includes the Supreme Court national action.

Figure 3: Changes in belief regarding same-sex marriage induced by same-sex-marriage legalization



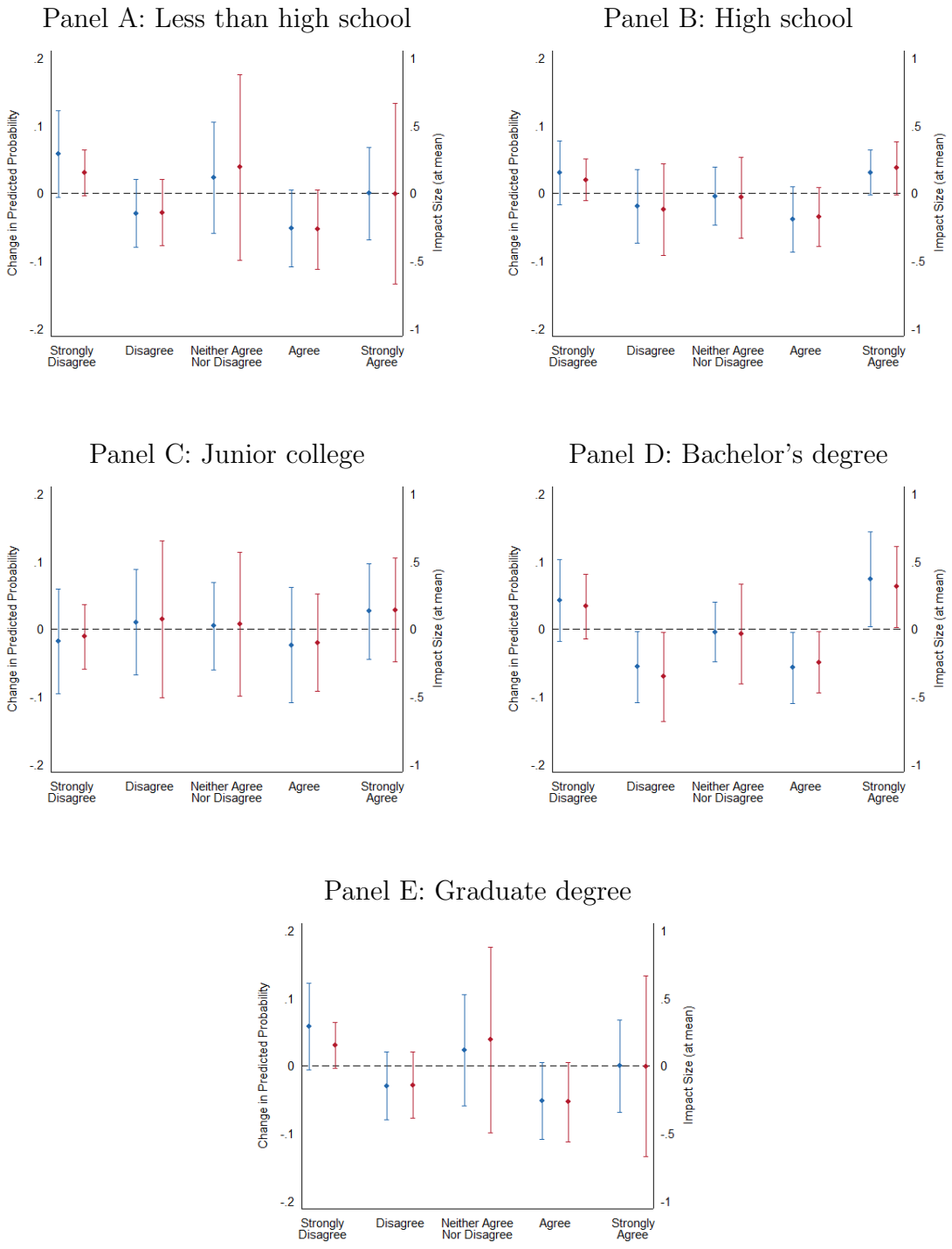
Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-percent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Figure 4: Changes in belief regarding same marriage induced by same-sex-marriage legalization, by generation



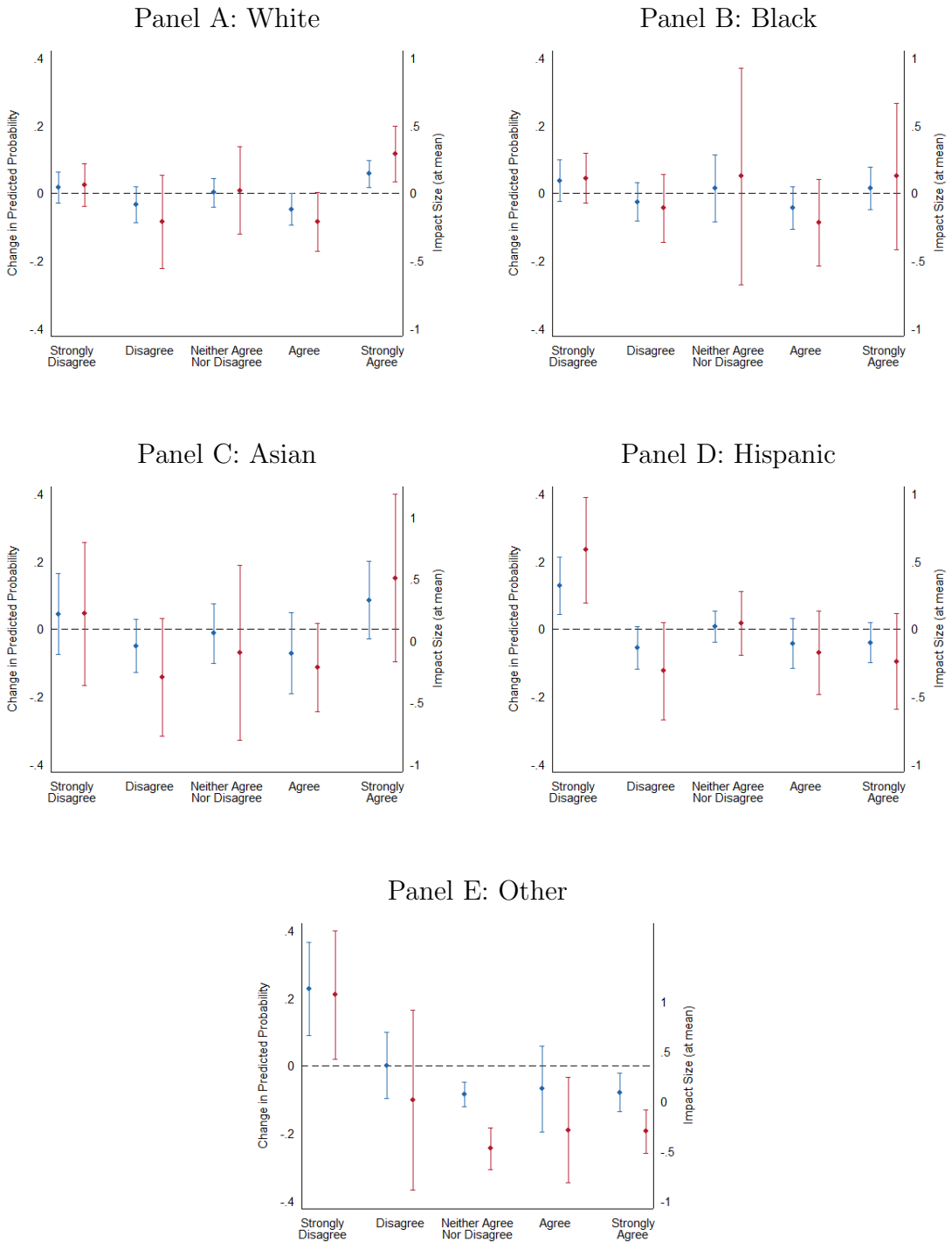
Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-percent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Figure 5: Changes in belief regarding same marriage induced by same-sex-marriage legalization, by education



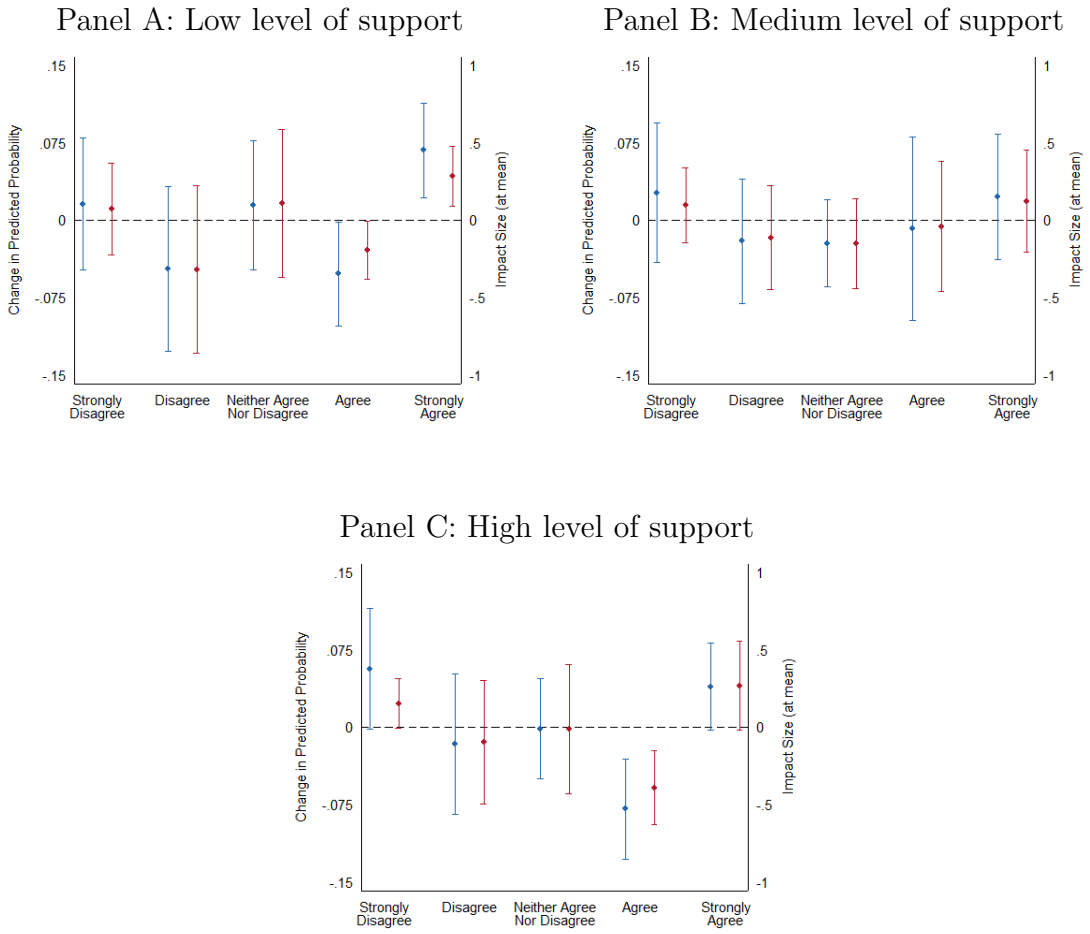
Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-percent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Figure 6: Changes in belief regarding same-sex marriage induced by same-sex-marriage legalization, by race



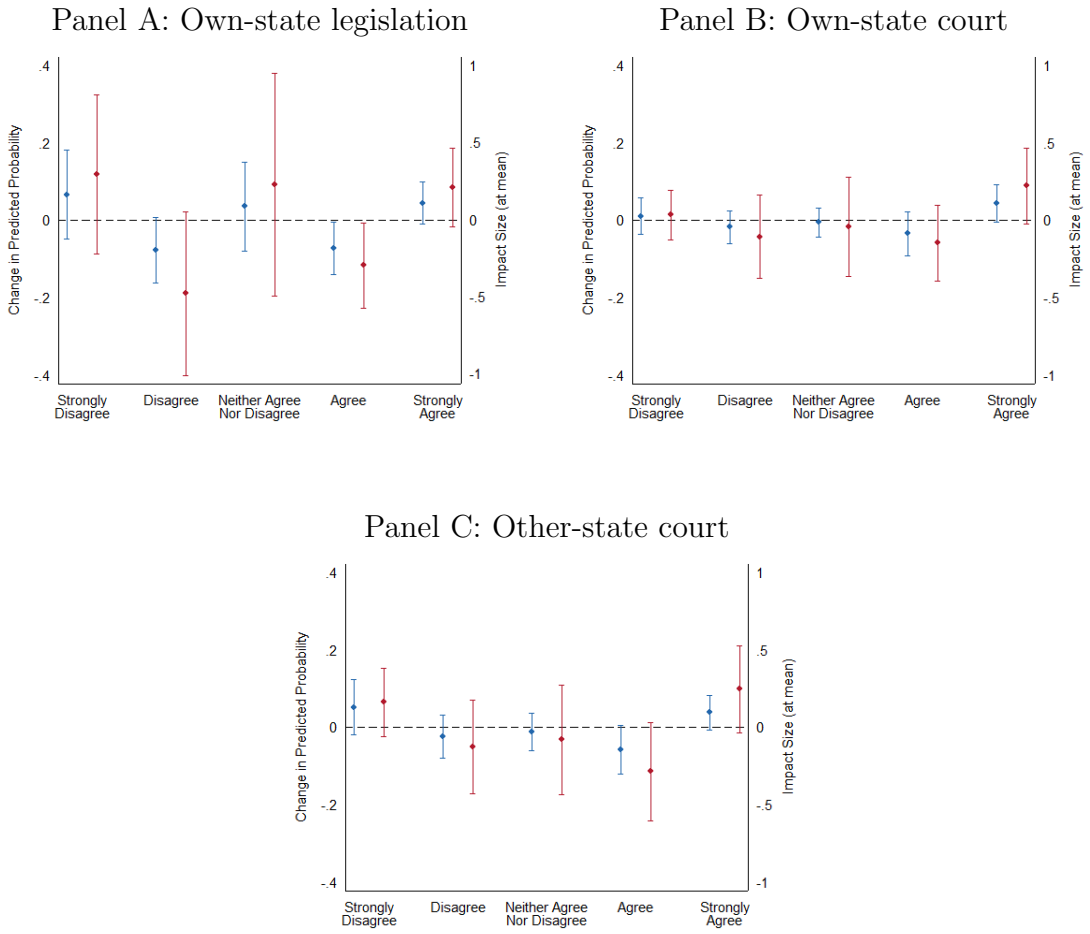
Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-percent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Figure 7: Changes in belief regarding same-sex marriage induced by same-sex-marriage legalization, by average state belief in 2004



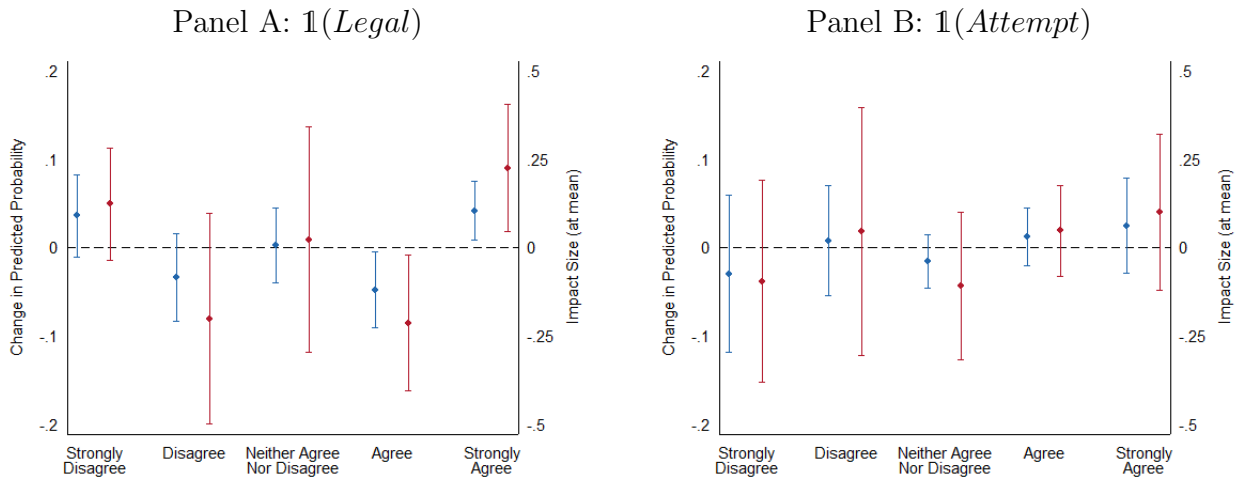
Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-percent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Figure 8: Changes in belief regarding same-sex marriage induced by same-sex-marriage legalization, by method of legalization



Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-perent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Figure 9: Impact of failed attempts to legalize same-sex marriage



Notes: On the left of each category (in blue), we plot the change in predicted probability with a 95-percent confidence interval from the multinomial logit model of the five-fold categorical response to "Do you agree or disagree? Homosexual couples should have the right to marry one another." Point estimates are interpreted as the average change in the predicted probability of a respondent selecting each of the five different opinion choices due to legalization. On the right of each category (in red), we plot the implied impact—the percent change in likelihood of occupying that category, evaluated at its (control) mean.

Tables

Table 1: Support for same-sex marriage around same-sex-marriage legalization, 2004–2016

	$\mathbb{1}(SA,\ A)$		
	(1)	(2)	(3)
$\mathbb{1}(Legal)$	0.033*	0.018	0.009
	(0.019)	(0.020)	(0.021)
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
State-specific linear trend	No	Yes	Yes
Individual controls	No	No	Yes
Observations	10,539	10,539	10,539
Mean	0.457	0.457	0.457
Impact (% at mean)	7.22	3.94	1.96

Notes: In all specifications, the dependent variable is equal to one where respondents either "Agree" or "Strongly agree" that homosexual couples should be allowed to marry, and zero otherwise. Individual-level controls include sex, race, age, work status, income, religion, and education. Standard errors in parentheses, allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 2: Same-sex-marriage legalization and the intensity of belief around the legalization same-sex marriage

	$\mathbb{1}(SD,\ SA)$	$\mathbb{1}(SD,\ N,\ SA)$
	(1)	(2)
$\mathbb{1}(Legal)$	0.092***	0.092**
	(0.024)	(0.034)
Observations	10,539	10,539
R^2	0.036	0.022
Mean	0.49	0.62
Impact (% at mean)	18.78	14.84

Notes: $\mathbb{1}(SD, SA)$ is an indicator variable for whether the respondent selected "strongly agree" or "strongly disagree" with legalizing same-sex marriage. $\mathbb{1}(SD, N, SA)$ is an indicator variable for whether the respondent selected "strongly agree," "neither agree nor disagree," or "strongly disagree." Specifications include state and year fixed effects, state-specific linear trends and individual-level controls. Standard errors in parentheses, allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 3: Polarization around same-sex-marriage legalization

	State-year standard deviation (1)	Esteban-Ray polarization index[a] (2)
$\mathbb{1}(Legal)$	0.031	0.065***
	(0.161)	(0.031)
Observations	291	291
R^2	0.413	0.405
Mean	1.43	0.38
StdDev	0.23	0.10
Impact (% at mean)	2.17	17.11
Effect size (at mean)	0.135	0.648

Notes: The data is collapsed to a state-year observation. Specifications include state and year fixed effects, state-specific linear trends and individual-level controls. Standard errors in parentheses, allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

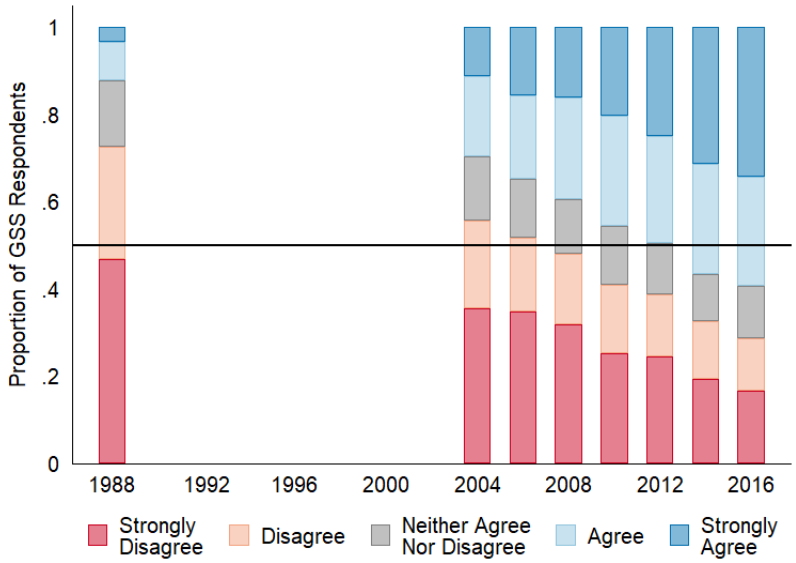
[a] Following Esteban and Ray (1994), we define polarization for each state-year as

$$ER = \sum_{i=1}^{5} \sum_{j=1}^{5} p_i^2 \cdot p_j \left| b_i - b_j \right|$$

where p_i represents the proportion of the sample with belief b_i. In our case, i and j capture the five categorical response (i.e., "strongly disagree" through "strongly agree"), and the index, ranges from the complete mass being at any single category (i.e., $ER = 0$) to half the mass at "Strongly disagree" and half the mass at "Strongly agree" (i.e., $ER = 1$).

A Appendix

Figure A1: Support for same-sex marriage, 1988 & 2004–2016



Notes: We plot the proportion of GSS respondents in each categorical response to the GSS question "Do you agree or disagree? Homosexual couples should have the right to marry one another," in all GSS surveys in which the question was asked (i.e., 1988, 2004, 2006, 2008, 2010, 2012, 2014, and 2016).

Table A1: Strength of opinion on same-sex marriage around same-sex-marriage legalization, 2004-2016

	Change in Probability (1)
Strongly disagree	0.034
	(0.023)
Disagree	-0.033
	(0.025)
Neither agree nor disagree	0.0026
	(0.022)
Agree	-0.047**
	(0.022)
Strongly agree	0.044**
	(0.017)
Pseudo R^2	0.117
Observations	10539

Notes: We report the average marginal effects from a multinomial specification across the five categorical variables. The specification includes state and year fixed effects, state-specific linear trends, and individual demographic controls. Standard errors in parentheses, allowing for clustering at the state level. "Less than high school" is the omitted group. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A2: Failed attempts to legalize same-sex marriage

State	Failed attempt	Successful attempt
Indiana	Jan 2005	Oct 2014
New York	Jul 2006	Jun 2011
Nebraska	Jul 2006	Jun 2015
Maryland	Sep 2007	Jan 2013
Texas	Aug 2010	Jun 2015
Hawaii	Aug 2012	Dec 2013
Nevada	Nov 2012	Oct 2014
Louisiana	Sep 2014	Jun 2015
Kentucky	Nov 2014	Jun 2015
Michigan	Nov 2014	Jun 2015
Ohio	Nov 2014	Jun 2015
Tennessee	Nov 2014	Jun 2015

Notes: We present states where there was a failed attempt to legalize same-sex marriage through the courts.