Changes in implicit bias, discrimination and labor market segregation: Evidence from the legalization of same-sex marriage

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Abstract

Mainstream economics has been, with a few exceptions, blind to the economic effects of discrimination of minority groups. Recently, Hsieh et al. (2019) showed that declining obstacles to human capital accumulation and labor market discrimination for blacks and women explain 44 percent of growth of U.S. GDP per person between 1960 and 2010. There has not been a formal study, to date, that investigates if a similar mechanism exists for sexual minorities. The way in which same-sex marriage (SSM) was legalized in the U.S., a staggered roll-out design, allows for the possibility of causal research. Using a homophobic (Google) search index (HSI) I find that whether SSM legalization occurred via the legislature, or the judiciary had dramatical different effects, ranging from 25 percent lower to 35 percent higher levels on the HSI, respectively. Building on Black et al. (2007)'s finding that homosexual men tend to crowd-out of industries where most workers are (heterosexual) men, as they might experience more discrimination, I test whether SSM legalization had an impact on labor market segregation. I find evidence suggesting that legalization-through-the-judiciary states saw an increase in segregation levels, while legalization-through-the-legislature states saw a decrease in segregation levels, suggesting a causal link between homophobic sentiment and labor market segregation.

1 Introduction

Mainstream economics has been, with a few exceptions, blind to the economic effects of discrimination of minority groups. Most of the literature focuses on testing what are the underlying motives for apparent discriminatory behavior: taste-based discrimination, statistical discrimination or discrimination driven by social norms. (Sansone, 2019) While knowing the underlying mechanisms of discrimination is useful for determining which are the appropriate policies to counter it, less is known about the direct economic effects of discrimination, whichever its motivations. Knowing the direct economic effects of discrimination aids in calculating the opportunity costs of preserving the *status quo*.

Recently, Hsieh et al. (2019) showed that declining obstacles to human capital accumulation and declining labor market discrimination for blacks and women explain 44 percent of growth of U.S. GDP per person between 1960 and 2010. They argue that a decrease in the misallocation of human capital across industries is the main mechanism behind this finding. In 1960, white men accounted for 94 percent of doctors and lawyers; by 2010, they made up for just over 60 percent and similar patterns occurred throughout the economy, particularly in high-skill occupations. Since 1960, women and black men both increased their human capital accumulation and increased their participation in high-skill industries, which in turn shifted the skill distribution of many industries to the right. There has not been a formal study, to date, that investigates if a similar mechanism exists for LGBTQ people. This is particularly relevant given that recent polls suggest LGBTQ populations estimates have been highly underestimated and hence their impact in the economy is likely to be higher than previously thought. (Jones, 2021) Synthetically, I investigate if same-sex marriage (SSM) legalization leads to changes in discrimination towards sexual minorities, and if so, whether this translates in changes in labor market segregation.

The way in which same-sex marriage was legalized in the U.S., a staggered roll-out design, allows for the possibility of causal research. Same-sex marriage legalization in the U.S. started in 2004, when the Massachusetts Supreme Judicial Court ruled in *Goodridge v. Department of Public Health* that it was unconstitutional under the Massachusetts Constitution to allow only opposite-sex couples to marry. It became legal nationwide in 2015 with *Obergefell v. Hodges*, a landmark decision of the Supreme Court of the United States (SCOTUS). Figure 1 shows the timing of same-sex marriage legalization at the state level. I exploit the variation in the timing to test whether there was a change in private attitudes, or bias, against sexual minorities. Instead of using a Two-Way Fixed Effects (TWFE), as it is invalid when treatment effects are not homogeneous across groups and time, I use a stacked regression which alleviates the concerns with TWFE.

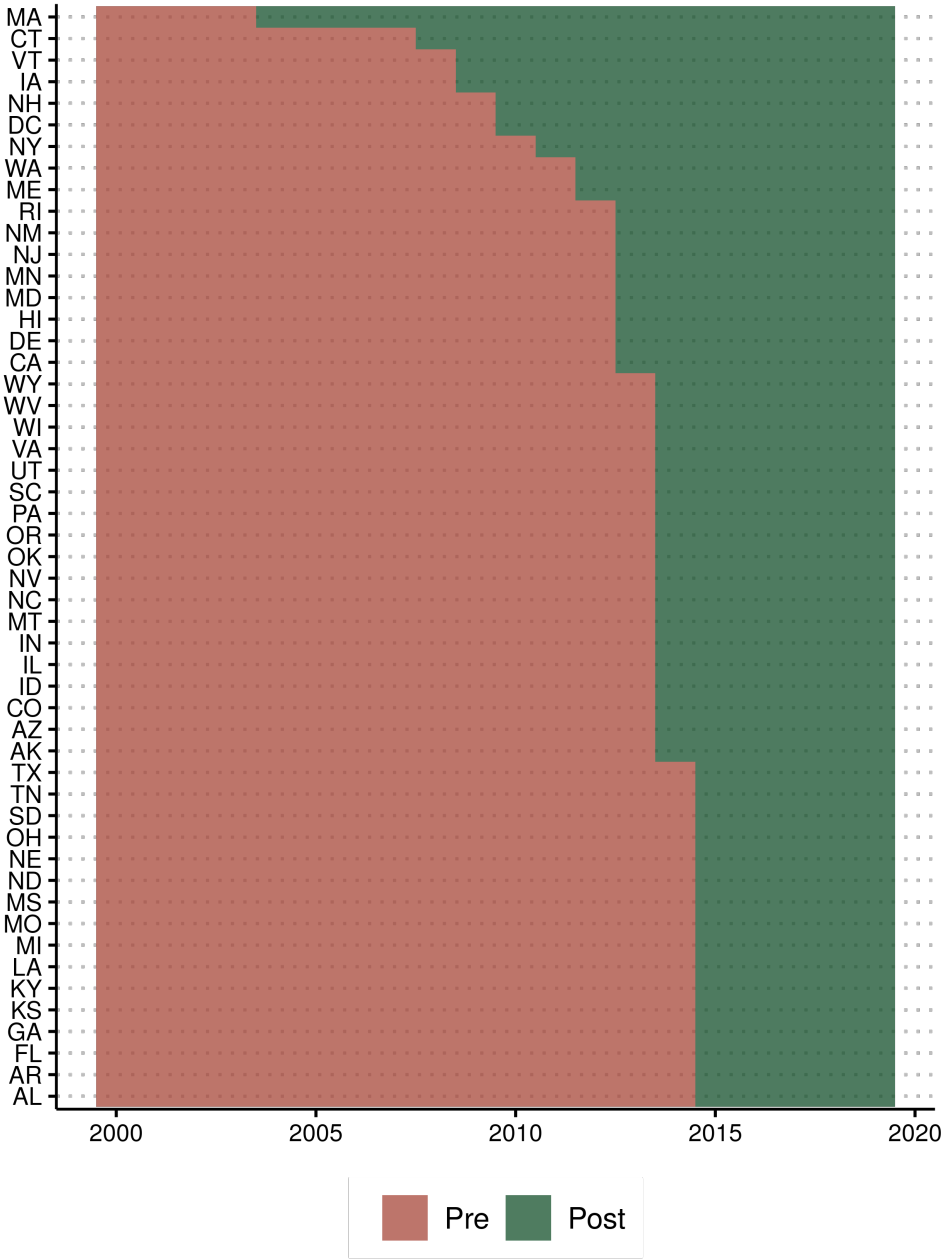

Figure 1: Timing of Same-sex marriage legalization in the U.S.

The path towards same-sex marriage legalization has not been linear. In 1993 Hawaii State Supreme Court (HSSC) was the first to consider legal challenges to bans on same-sex marriage. However, in 1998 before HSSC considered the final appeal of the case, voters modified the state Constitution to restrict marriage to different-sex couples. In the midst of the debate, many other states followed Hawaii and constituted a constitutional ban on same-sex marriage. Hatzenbuehler et al. (2010) examines the relation between living in states that instituted bans on same-sex marriage during the 2004-2005 elections and the prevalence of psychiatric morbidities in LGB populations. His findings suggest that living in states where same-sex marriage bans were instituted signify an increase in the prevalence of psychiatric morbidities of: 248.2 percent for general anxiety disorder; 41.2

percent for alcohol use disorder; 36.6 percent for any mood disorder; and 36.3 percent for psychiatric comorbidities.

Hatzenbuehler (2011) has shown that the social environment surrounding lesbian, gay and bisexual youth may contribute to their higher rates of suicide attempts, once controlling for individual risk factors. He estimates that suicide risk for LGB youth is 20 percent higher than their heterosexual counterparts in an unsupportive environment.[1] In a study with a more direct relationship with my research, Everett et al. (2016), the authors study the effect of civil union legalization (a close substitute to same-sex marriage for some authors) on perceived discrimination, depressive symptoms, and indicators of hazardous drinking for sexual minority women. They find that civil union legislation was associated with lower levels in all these variables. More recently, Perales and Todd (2018) expand the available evidence to Australia. The authors analyze the effects of the 2017 plebiscite regarding same-sex marriage legalization. They find that LGB people report comparatively worse life satisfaction, mental health and overall health in constituencies with higher shares of 'No' voters, controlling for a large set of individual- and aggregate-level confounds.

Discrimination, then, has real effects in the well-being of sexual minorities. Moreover, it is linked with adverse effects for society as a whole. According to Lamontagne et al. (2018), homophobia is associated with negative social, economic and health outcomes in low- and middle-income countries. Moreover, the authors construct an index of homophobia at the country level and find that a 10 percent increase in GDP per capita is associated with a 1 percentage point reduction in the mean of their homophobic climate index. My research aims to bridge the gap between the correlational evidence between homophobia and negative economic outcomes, and finding causal evidence.

There are three main contributions of this paper. First, hypothesizing based on Constitutional Law theory I test for heterogeneous impacts in discrimination depending on whether SSM is legalized through the legislature or the judiciary. Second, I proxy discrimination using a veiled measure for discriminatory attitudes towards homosexual men, building on the fact that survey respondents are likely to lie whenever being asked to give their opinion about sensitive topics directly, i.e., using an unveiled measure. Third, I test for changes in labor market segregation of sexual minorities, potentially driven by discrimination.

Using a stacked Difference-in-Difference (DID) approach, which avoids the pitfalls of the canonical Two-Way-Fixed-Effects in a staggered treatment setting, I find that legalizing SSM through the judiciary leads to *increased* levels of homophobic attitudes measured through the volume of google searches of the homophobic epithet. Legalization

[1]The social environment is measured considering: (1) proportion of same-sex couples living in the counties; (2) proportion of Democrats living in the counties; (3) proportion of schools with gay-straight alliances; (4) proportion of schools with anti-bullying policies specifically protecting LGB students; and (5) proportion of schools with anti-discrimination policies that included sexual orientation.

through the legislature generates the opposite pattern: *decreased* homophobic attitudes in the following years of SSM legalization. Based on these results, I test for a differentiated change in labor market segregation of sexual minorities and find patterns consistent with discrimination driving sexual minorities' selection in different occupations and industries. I find that judiciary-legalized-SSM-states show an *increase* in labor market segregation, while legislature-legalized-SSM-states show a *decrease* in labor market segregation.

The rest of the paper is distributed as follows. Section 2 summarizes the literature of changes in attitudes towards LGBTQ populations, and the literature of labor market discrimination and segregation of sexual minorities. Section 3 provides the background of this study. Section 4 motivates and explains the data sources used. Section 5 discusses the empirical strategy. Section 6 shows the results, discusses them and provides robustness checks. Finally, Section 7 provides some concluding remarks.

2 Literature Review

2.1 Changes in public opinion

There has been a considerable amount of research on public opinion changes towards LGBTQ issues, mainly in political science and sociology. Kreitzer et al. (2014) is one of the first studies to investigate whether major events concerning minority groups change public opinion towards them. The authors study the effect of the 2009 Iowa Supreme Court ruling, *Varnum v. Brien*, which upheld that the state's limitation of marriage rights to opposite-sex couples violated the State Constitution's equal protection clause. Using survey data from the Iowa Social Science Research Center (ISSRC) collected in the spring of 2009 and a re-interview after the court's decision, they find that the signaling of new social norms pressured some respondents to modify their expressed attitudes. Specifically, respondents whose demographic characteristics would predict support for marriage equality, but previously did not, were more likely to shift their opinions to be consistent with the new state law. The main problem with these findings is that it is impossible to know if the public opinion towards sexual minorities *truly* shifted positively or if it is a function of individuals having to conform to the signaled shift in social norms. Perhaps their implicit biases do not change, and discriminatory practices are upheld.

A large proportion of the public opinion literature centers on the existence of backlash after challenges to the pre-existing social norms. Bishin et al. (2016) define opinion backlash as "a large, negative, and enduring shift in opinion against a policy or group that occurs in response to some event that threatens the *status quo*". This seems to be now the standard definition, and throughout this paper I would adscribe to it.

Bishin et al. (2016) examine if SCOTUS' *Obergefell v. Hodges* prompted backlash against gays and lesbians mainly using an online survey experiment using Amazon Me-

chanical Turk (AMT) as a subject recruitment program with a sample of 2,402 respondents. They began the survey on June 7 and stopped the survey on June 17, days before SCOTUS rendered *United States v. Windsor* on June 26, 2013, where they declare the Defense of Marriage Act (DOMA) as unconstitutional, and state legalizations of same-sex marriage. Their method consists of exposing subjects to one of five randomly assigned news excerpts that contain information about gays and lesbians and compare it to one baseline condition that contains no information regarding them; the measure of backlash is the difference between the mean opinion in the baseline condition from the mean opinion in the treatment. It is worth noting that while they find negative results, particularly, when analyzing backlash prompted by legalization through the judiciary, indicating backlash, they dismiss them as "in no case are the effects significant or large". Moreover, their methods are not suitable to test their definition of backlash, which emphasizes an *enduring shift* in public opinion.

More generally, Flores and Barclay (2016) study the effects of state-level and nationwide policy changes regarding same-sex marriage during SCOTUS' 2013 decision. Using data from the American National Election Study (ANES) from 2012 and a re-contact study in 2013, the authors find that residents of states that had same-sex marriage policy introduced had the greatest reduction of anti-gay attitudes. They are the first to analyze alternative mechanisms through which public opinion changes may occur: consensus, legitimacy, polarization and backlash. According to them, the underlying mechanism of their findings is that of *consensus*, i.e., policy and judicial acts may simply be the enactment of the majority opinion and bear no subsequent impact on mass attitudes, and/or, that of *legitimacy*, i.e., laws may represent the acceptability of an issue, so judicial and legislative actions may enshrine shifts in public opinion through people's own respect for the rule of law.

While most of the literature has focused on the U.S., Abou-Chadi and Finnigan (2019) study the European case. Combining data from eight waves of the European Social Survey (2002 – 2017) with data on legislation, the authors analyze the effects of same-sex marriage, registered partnerships, and marriage bans on attitudes toward gays and lesbians. They argue that different same-sex relationship policies vary in their impact. Whereas registered partnership laws construct a distinct target population that receives new benefits, marriage equality sends an unambiguously positive signal and reduces the perceived group difference through inclusion into existing rights. Their findings suggest that marriage has a positive effect, while bans and registered partnerships have a negative effect. Their main similarity to my research is that they consider heterogeneities on attitude changes depending on the signal the policy shift sends to the population.

The problem with prior studies cited before is that they focus on self-reported biases against LGBTQ populations. Ofosu et al. (2019) are the first to analyze changes in implicit biases, which are a better proxy for the probability of discrimination against

minorities. Using data from the Implicit Association Test[2] (IAT) they tested whether state-by-state same-sex marriage legislation was associated with decreases in anti-gay implicit bias. Surprisingly, they find that moderating this effect was whether states passed legislation locally: although states passing legislation experienced a greater *decrease* in bias following legislation, states that never passed legislation demonstrated *increased* anti-gay bias following federal legalization. This is the first study to explicitly consider the possibility for a heterogeneous effect by the legalization method.

According to the Bishin et al. (2016) definition of opinion backlash, backlash after same-sex marriage legalization is possible regardless of its method of legalization. Even though Flores and Barclay (2016) do mention that backlash theorists consider court action more likely to prompt adverse reactions, as legislative or direct democratic institutions are inherently responsive to the majority will, they do not elaborate on it. As mentioned, apart from Ofosu et al. (2019), no other study has considered the possibility for differences in same-sex marriage legalization depending on its legalization method. I contribute to this literature by bridging this gap and analyzing the changes from 2004 to 2019 using a homophobic (Google) search index that measures implicit bias.

2.2 Labor market discrimination and segregation

It was not until the late 1990's and early 2000s that economists started to study LGBTQ issues formally. Badgett (2010) is a pioneer work that aims to argue, from an economic perspective, that same-sex marriage signified a Pareto improvement in society. The author argues that same-sex couples gain economic rights through same-sex marriage, as well as those related to taxation, state employee benefits, and dissolution, which provide an important and valuable economic benefit. Demand for same-sex marriage before its legalization is another proxy for the economic value of marriage to same-sex couples.

While Badgett (2010) provides a broad economic conceptualization of same-sex marriage, Carpenter and Eppink (2017) analyze its potential effects in same-sex couples income and labor decisions using National Health Interview Survey (NHIS) data from 2013 to 2015. They reproduce a well-documented finding that self-identified lesbians earn significantly more than comparable heterosexual women. They also show that self-identified gay men also earn significantly more than comparable heterosexual men, a difference on the order of 10 percent of annual earnings; a finding that contrasts previous studies. Nonetheless, self-identified gay men have lower employment rates.[3]

Carpenter and Eppink (2017) take into account the improvement in public opinion (measured through survey polls) towards LGBTQ populations in the U.S., and investigate

[2] https://implicit.harvard.edu/implicit/aboutus.html

[3] In particular, gay men are estimated to be 5.4 percentage points less likely than comparable heterosexual men to be in full-time work, while bisexual men are 11.9 percentage points less likely to be in full-time work.

whether it explains the earnings increase of gay men. They argue that although there has likely been a reduction in the extent of labor market discrimination against gay men, it is unlikely to explain the overall patterns observed in the NHIS, as they remain underemployed relative to their heterosexual counterparts. According to the authors, the gap in employment levels between homosexual and heterosexual men sheds skepticism on the apparent overall improvement in public opinion about LGBTQ issues. They mention, though unfortunately they do not cite their reference, that there were substantial increases in LGBTQ-related harassment reported to governments and police agencies in the wake of major policy rulings on same-sex marriage, and that there is still pervasive anti-LGBTQ sentiment throughout the United States.

In a more recent study, Sansone (2019) tests the effect of same-sex marriage legalization on same-sex couples' employment, which he argues is theoretically unclear. On the one hand, following a standard Becker model, these changes could have discouraged individuals in a same-sex couple from both being employed at the same time. On the other hand, it is possible that SSM legalization drove a shift in social norms and a reduction in discrimination against sexual minorities; a more tolerant working environment may have then increased both the labor supply and demand of individuals in same-sex couples. finds evidence supporting the increase in labor supply and demand of individuals in same-sex couples due to a reduction in discrimination against sexual minorities. Specifically, he finds that same-sex marriage legalization increased the probability that both partners in same-sex couples were working by 2.4 percentage points, which is equivalent to an almost 4 percent increase from his baseline employment levels.

Sansone (2019) devotes several efforts to test for the plausibility that a decrease in discrimination against sexual minorities was the main driver in the observed short-run increases in employment. For instance, he adds an indicator for whether states introduced other policies affecting LGBTQ individuals in the time period considered (a constitutional ban on same-sex marriage, legalized domestic partnership and civil unions, anti-discrimination laws, and allowed or prohibited adoptions by same-sex couples). He finds that favorable policies towards sexual minorities increase the probability that both partners in same-sex couples were working, while unfavorable policies diminish it.

Additionally, he considers the fact that, according to Plug et al. (2014), LGBTQ workers tend to sort into tolerant occupations, as comparing twins with different sexual orientations, gays, lesbians and bisexuals were less likely to work in occupations with prejudiced workers. As well as the fact that, according to Black et al. (2007), workers in male same-sex couples were in occupations with a higher proportion of women than workers in different-sex couples. He then tests if same-sex marriage legalization induced a shift of homosexual men workers towards historically tolerant occupations (or to disclose their sexual orientation if already employed in these sectors). He finds that their probability of being employed in an occupation with a majority of female workers decreased by

1.4 percentage points after same-sex marriage legalization. Put differently, this finding implies that homosexual men labor segregation *decreased* after SSM. I contribute to the literature testing the segregational effect of SSM more formally.

3 Background

The theoretical framework I consider for the differences in the changes in public opinion depending on the legalization method is drawn from Constitutional Law theory. Siegel (2017) explains that according to the *judicial backlash thesis*, courts striking down popular legislation to vindicate minority rights are not only ineffective, but counterproductive: "judicial decisions 'shutting down' politics could frustrate democratic majorities in ways that would produce more virulent politics than might have resulted had judges refused to intervene". In other words, as the judiciary is not legitimized to make political decisions (as they are not democratically elected), when they settle controverted debates through rulings, a backlash occurs.

The theoretical discussion of whether courts rulings prompt backlash is not a marginal one relegated to Law faculties. In fact, in the landmark SCOTUS case *Obergefell v. Hodges*, Chief Justice Roberts insisted that while SSM had an undeniable normative appeal in terms of equality, he argued that legalizing it through a court order was not the appropriate track. He argued that SCOTUS is not a legislature, and in a democracy only legislatures should promote social change; the role of the courts is only to ensure the appropriate enforcement of society's agreements. Not doing so could be seen as an imposition: a small set of people deciding for the rest of society. Based on this discussion, I theorized that a backlash would occur only in states where the method of legalization was judicial; states where it was legalized through the legislature more likely reflect public opinion and thus would not be seen as an imposition. Figure 2 shows which was the legalization method for every state.

Most of the discussion from legal theorists about the *judicial backlash thesis* is based on anecdotal evidence, or, for those who argue that it is unlikely, based on survey polls which as I will explain later, do not accurately reflect the true changes in opinion about controverted topics. A main contribution of this paper is to test the *judicial backlash thesis* formally using an appropriate measurement of changes in homonegative sentiment; I find results that empirically support it.

The heterogeneous effect that SSM legalization has on homophobic attitudes, likely correlated with discrimination, allows for the possibility to test whether changes in discrimination have an effect on economic outcomes, in particular, on labor market segregation of sexual minorities.

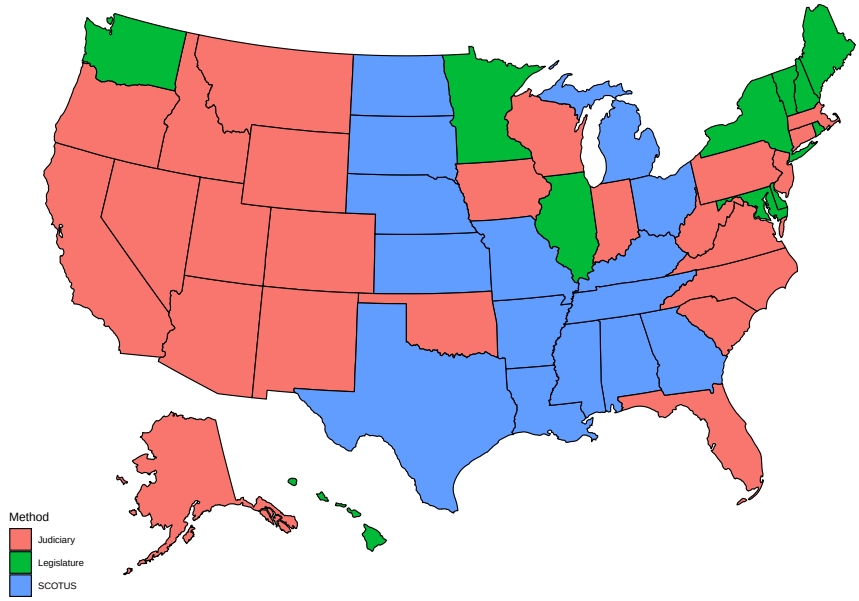

Figure 2: Same-sex marriage legalization methods

4 Data

4.1 Homophobic attitudes

Most studies on the impact of same-sex marriage on public opinion rely on survey data. Nonetheless, as Coffman et al. (2017) show, it is likely that these measures underestimate the prevalence of homonegative attitudes. In a series of online experiments using a large and diverse but non-representative sample, they compare population estimates from the standard methodology of asking sensitive questions to measures from a "veiled" methodology. The veiled method increased self-reports of anti-gay sentiment. Particularly, in the workplace, respondents were 67 percent more likely to disapprove of an openly gay manager when asked with a veil, and 71 percent more likely to say it should be legal to discriminate in hiring on the basis of sexual orientation. Their results motivate the use of alternative methods to measure homonegative sentiment.

Google search queries are a publicly available source of data that could be used as a veiled measurement of public attitudes. It is particularly great in the current case as a homonegative bias may be socially unacceptable and people are likely to self-censor with unveiled methods. It has proven as a valuable asset for social science research. For instance, Stephens-Davidowitz (2014) used Google searches to estimate the Barack Obama's 2008 election costs of racial animus.

Similarly, I construct a homophobic search index (HSI) at the state level using the search rate for the words "faggot", "faggots", "fag", "fags", as well as their misspellings,

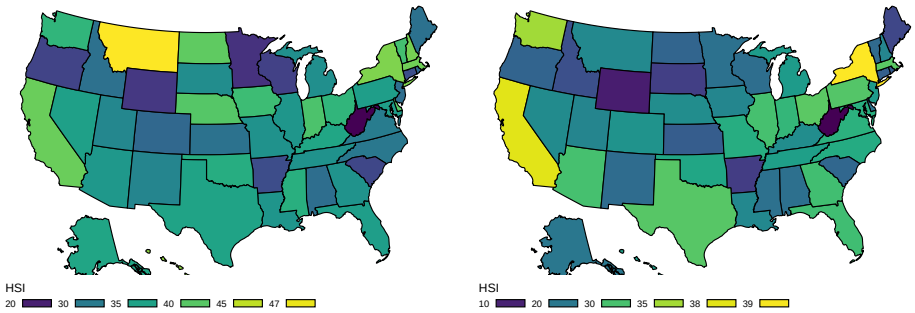

Figure 3: HSI before and after SSM legalization

"fagot" and "fagots" for every US state plus D.C. between 2004 and 2019.[4] The search index is normalized to the state and year with the highest search hits, and the rest of the state-year observations are re-scaled from 0 to 100, this way, each state-year observation of the HSI represents the relative popularity across geographies and years. Otherwise, places with the most search volume would always be ranked highest and the HSI would not be comparable. The main complication arises as Google limits the number of geographical areas that can be compared at the same time to five. To elude this limitation, I consider the approach taken by Paul Goldsmith-Pinkham (2020). I obtain data for each state relative to the national level of searches and re-normalize each state by $\frac{maxIndex_s}{maxIndex_{US}}$. Figure 3 shows the HSI in 2004 and in 2019. I lay out the construction of the HSI in more detail in Appendix A.

I chose to focus on the homophobic epithet based on the fact that it showed the highest variation state- and year-wise. There are certainly different combinations of words that would be appropriate for specific regions. For instance, in Figure 8 in Appendix B I show the average HSI for the words "sodomy", "gomorrah", "leviticus", and "adultery", which have a negative connotation in Judeo-Christian religions. Interestingly, they have the highest search rate in states where the Southern Baptist Convention is the predominant religious group, according to the 2010 U.S. Religious Census. This points to the preference of using more tailored search indexes when doing regional or state-level studies.

It is worth stressing that while Google Search indisputably receives the most daily

[4]The motivation behind considering their misspellings is that they are related to homonegative sentiment. Google shows related queries to every given word. Consistently, "fagot" and "fagots" are related to "god hates fags".

number of queries than any other search engine in the U.S., its representativeness has not been the same throughout its history. For instance, the U.S. search index for "weather", a fairly common search query, displays an upward trend from 2004 to date. This likely reflects the increase in access to the internet. In order to control for this trend, in every regression where a search index is the dependent variable, I include the search index for "weather" as a control.

4.2 Labor market segregation

Table 1: Descriptive statistics by behavioral sexual identity

Variable	SS men	DS men	DS women	SS women
Emp. rate	0.75	0.75	0.75	0.75
% aged between 18 and 35	0.18	0.18	0.18	0.18
Avg pre-tax annual income	60,076	62,272	29,918	46,853
% black	0.05	0.06	0.06	0.07
% hispanic	0.11	0.10	0.10	0.10
% with a bachelor's degree or more	0.46	0.33	0.33	0.44
Share who speaks english	1.00	0.99	0.99	1.00
N	141,202	11,390,086	11,390,086	142,188

Notes: SS denotes groups that are in a same-sex marriage or partnership, and DS denotes groups that are in a different-sex marriage or partnership. The data consists of married or partnered individuals in the ACS 1% samples from 2000 to 2019.

The American Community Survey (ACS) is one of the most used data sources to conduct research involving sexual minorities. It is possible to identify behavioral homosexual men and women as the ACS respondents that report being married or cohabiting with a same-sex person as their partner. The main downside to this approach is that the sample of homosexual men and women is *not* representative of the gay and lesbian population, much less of the LGBTQ community. Table 1 shows summary statistics for the whole time-frame considered, 2000 to 2019, by identity level. As found in previous studies, homosexual men and women are more educated and earn more than their heterosexual counterparts. Nonetheless, this is likely to be biased upwards representing a survivorship bias, given that recent studies show an over-representation of the LGBTQ community in the experiences of homelessness across the U.S. (Fraser et al., 2019)

The fact that homosexual men, in this sample, tend to be more educated than their heterosexual counterparts suggest that the impact of their labor market segregation could be quite high. Figure 12 in Appendix B show the relationship between the income average and share of college educated with a bachelor's degree or higher between homosexual men

and heterosexual men per industry, respectively. Interestingly, homosexual men earn more on average for industries at the right side of the income distribution; while homosexual men are more educated on average across all industries. Even if homosexual men represent a small fraction of the population, they accumulate a large amount of human capital, which in turn suggests that their misallocation from labor market segregation might have a greater-than-expected impact on the economy as a whole.

The ACS reproduces a stylized fact in the literature: that homosexual men tend to concentrate in female-dominated industries and occupations. Figure 13 in Appendix B provides detailed picture of this relationship. While homosexual men tend to crowd-in industries with a higher share of heterosexual-women and crowd-out industries with a higher share of heterosexual-men, homosexual women do not follow a symmetric pattern, and instead behave similar to heterosexual women. This finding suggests that the drivers behind gender labor market segregation have more weight than the drivers behind sexual minority labor market segregation. Given this finding, I will focus on the labor market segregation of homosexual men.

$$D_j = \frac{1}{2} \sum_{i}^{J} \left| \frac{h_{j,i}}{H_{j,i}} - \frac{m_{j,i}}{M_{j,i}} \right| \tag{1}$$

In order to test for changes in labor market segregation I construct a *dissimilarity index*, expressed synthetically by Equation 1, based on Duncan and Duncan (1955). $\frac{j,i}{H_{j,i}}$ is the share of homosexual men workers from state j in industry/occupation i and $\frac{m_{j,i}}{M_{j,i}}$ is the share of heterosexual men workers from state j in industry/occupation i. It represents the share of homosexual men in state j that would have to move between industries/occupations i in order to be distributed the same way as heterosexual men. Note how the base rate in each case is the pool of each group of workers. Similarly to Hsieh et al. (2019), the implicit assumption behind using this measure is that the skill distribution is the same between both groups, so the fact that the industry/occupation distribution is not the same across groups represents a misallocated economy. Table 2 shows the industries that show the highest difference in identity-shares, for instance, in the case of the Construction industry, homosexual men are on average underrepresented by 6% of their total worker pool. Table 4 in Appendix B shows the occupations with the highest difference in identity-shares.

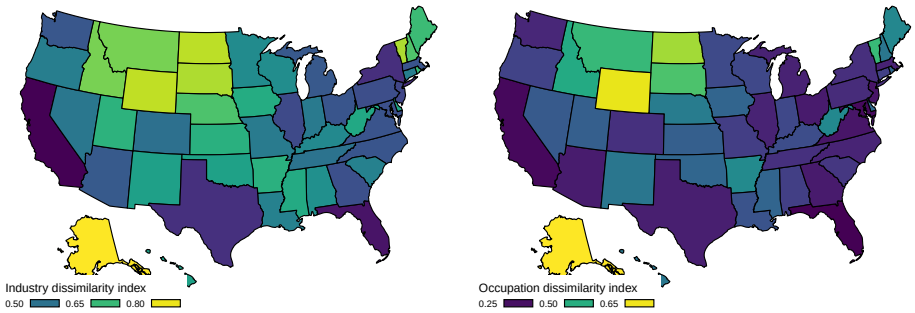

Figure 4: Dissimilarity indices state averages (2000-2019)

Table 2: Top industries with the highest share difference between heterosexual and homosexual men

Industry name	Diff in industry-identity share
Construction	0.06
Transportation: Trucking services	0.01
Public administration: Justice, public order and safety	0.01
Agricultural production, crops	0.01
Automotive repair and related services	0.01

Notes: The difference represents the distributional differences between both groups. I consider the average differences across states between 2000 and 2019. In order to have a set of industries that is comparable across time I consider the occupation variable homologated to 2010 as there is no more recent standardization.

I calculate the dissimilarity index $D_{j,t}$, for both occupations and industries, at the state-year level to formally test if legalization of SSM has segregational effects in the United States. Figure 4 shows the geographic distribution of the dissimilarity indices averages. The main thing to note is that there is greater variance at the industry level, mainly because the occupation variable in the ACS is aggregated to be consistent through time. The state with the lowest occupation dissimilarity index average is Florida with 0.23, while the state with the highest occupation dissimilarity index average is Alaska with 0.66. In the case of the industry dissimilarity index, the state with the lowest score is California with 0.31 and the state with the highest score is again Alaska with 0.81.

5 Empirical strategy

Staggered roll-out designs have been considered a more robust approach to a single DID as the typical concern is that contemporaneous trends could confound the treatment effect, violating the main DID identification strategy, the existence of parallel trends. However, recent econometric work shows that the standard DID approach followed in these settings, using a Two-Way Fixed Effects (TWFE), is valid only when treatment effects are homogeneous across groups and time, which, for most applications, is implausible. Goodman-Bacon (2018) explains that the problem with TWFE arises when already-treated units act as controls, as changes in their treatment effects over time get subtracted from the TWFE estimate.

Following Cengiz et al. (2019) and Baker et al. (2021) I create event-specific datasets (for every year one or many states legalize SSM), including the outcome variable and controls for the treated state and all other states up to when they become treated. Thus, I am only including the untreated observations for the states not in that cohort. This way, I have only "clean controls" for every group. I then stack these event-specific datasets in relative time to calculate the DID event-studies relative to the reference period, which is the treatment year.

After constructing the stacked dataset, I consider event-study models of the form given by 2. An advantage of event-study functional forms is that they help evaluate the credibility of the parallel trends assumption. As Baker et al. (2021) notes, the only difference in terms of functional form regarding a simple event-study regression is the need to saturate the group and time fixed effects with indicators for each event-specific dataset. I restrict the time window of the event study to $[-5, 1]$ and $[1, 10]$. One main difference between the stacked regression event-studies and a simple event-studies is that in the former, there is no need to include the full set of relative time indicators, as it is the case with the latter. (Baker et al., 2021)

$$y_{j,t,G} = \gamma_{j,G} + \tau_{t,G} + \sum_{k \neq 0} \delta_k \mathbb{I}[t - G_j = k] + \varepsilon_{j,t,G} \tag{2}$$

In Model 2, $\gamma_{j,g}$ and $\tau_{t,g}$ are the individual and time saturated fixed effects. $\mathbb{I}[t - G_j = k]$ is an indicator for being k years from the treatment starting for cohort G. G_j simply states that state j was treated with cohort G.

$$log(HSI)_{j,t,G} = \gamma_{j,G} + \tau_{t,G} + \overline{X}'_{j,t,G} + \sum_{k \neq 0} \delta_k \mathbb{I}[t - G_j = k] + \varepsilon_{j,t,G} \tag{3}$$

In particular, Model 3 is the specification I use to test for the effect of same-sex marriage on the homonegative implicit bias. I consider the natural logarithm as the dependent variable as to have a cleaner interpretation of the results. $\overline{X}'_{j,t,G}$ is the set of

state-year specific controls shown in Table 1 calculated at the state-year level, plus the constructed search index for "weather".

$$D_{j,t,G} = \gamma_{j,G} + \tau_{t,G} + \overline{X}_{j,t,G} + \sum_{k \neq 0} \delta_k \mathbb{I}[t - G_j = k] + \varepsilon_{j,t,G} \tag{4}$$

Model 4 is the specification I use to test if same-sex marriage had an effect on labor market segregation of homosexual men. $\overline{X}_{j,t,G}$ only includes the set of state-year specific controls shown in Table 1 calculated at the state-year level.

6 Results

6.1 Changes in public opinion

Figure 5 shows the DID event-studies by legalization method of same-sex marriage of the log of the constructed homophobic search index. The left panel considers as treated units only states where it was legalized through a court decision. Recalling the Bishin et al. (2016) definition of opinion backlash: "a large, negative, and enduring shift in opinion against a policy or group that occurs in response to some event that threatens the status quo", the plotted coefficients show evidence for it.

The first thing to note from Figure 5 is that the parallel trends assumption seems to hold. The lead point estimates do not follow a clear upward or downward trend, and each coefficient is not statistically different from zero. Assuming this is the case, 9 and 10 years later, this search index is 36.06 and 35 percent higher than the year SSM was legalized, respectively.[5]

[5] Considering a log transformation of a variable as the dependent variable in an Ordinary Least Squares regression yields a coefficient with an interpretation of an approximate percentage change. The correct percentage change is obtained using the formula $\%\Delta y = 100(e^{\beta} - 1)$ where y is the non-transformed dependent variable and β the coefficient of interest. I obtain the percentage change this way for all the results presented non-graphically.

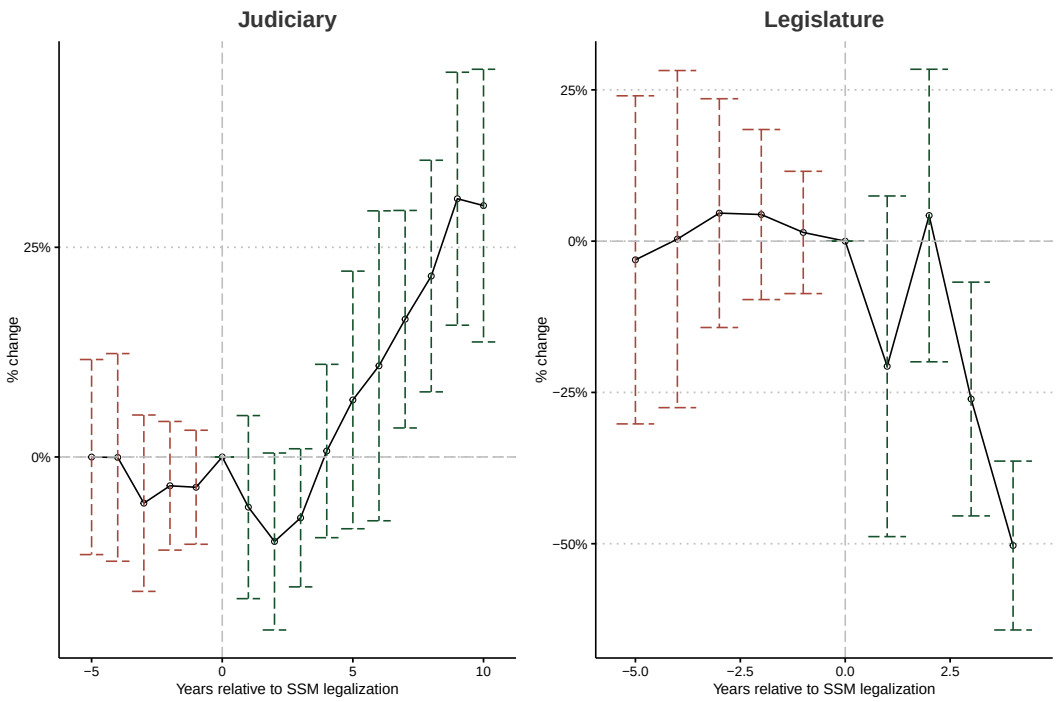

Figure 5: DID event study by legalization method using stacked regressions. $log(HSI)$ as dependent variable.

The opposite is true for the states that legalized SSM through the legislature, but the change seems to happen at a faster rate. Again, assuming that indeed the parallel trends assumption holds, which is plausible in this case too as all the pre-period coefficients are not statistically significant different from zero, the homophobic search index is 14.52 and 25 percent lower on average, 3 and 4 years after SSM legalization, than it would have been had SSM not been legalized through the legislature. The rest of the lag coefficients are collinear with the saturated fixed effects.

A major advantage of testing changes in homonegative attitudes using the HSI is that I consider this measure for every U.S. state from 2004 to 2019, and thus, the results have more external validity than if I had considered only one state or just one cohort. In contrast, Kreitzer et al. (2014) focus only on Iowa's 2009 SSM legalization. Similarly, Flores and Barclay (2016) focus only on Maine and Washington's SSM legalization via the legislature.[6] As stated before, even prior studies like Bishin et al. (2016) that consider more states, are not suited to test if SSM legalization caused an *enduring* shift in social norms. The authors' results rely on survey data from 41 days, and SSM was not even legalized in any state within the time frame they study.

Ofosu et al. (2019) do test for changes in homonegative attitudes for every state between 2005 and 2016. The authors find qualitatively similar results with data from the Implicit Association Test (IAT): legalization via the judiciary prompts backlash, whereas

[6]It is worth noting that their results showing a decrease in homonegative attitudes are in line with the results shown in this paper using the HSI.

via the legislature antigay bias decreases. In Figure 15 in Appendix B I plot the event studies considering the IAT implicit bias change rate as the dependent variable, which is the same that Ofosu et al. (2019) use in their analysis. The IAT implicit bias ranges from -0.5 to 0.5, where a negative score indicates a negative bias towards sexual minorities. The results using the IAT implicit bias as the dependent variable are qualitatively similar. One main advantage of using the HSI instead of data from the IAT is that most of the respondents of this test are young women, so the results might not be representative. Google searches might suffer from the same concern of nonrepresentativeness, but it might be a lesser concern given the volume of search queries.

One thing we might worry about is that an increase in homophobic bias does not translate in increases of homophobic behavior. However, there are a number of studies who link increases in implicit biases against certain minority groups with increases in discriminatory behavior against them. For example, Glover et al. (2017) analyze if French retail shop managers' bias against South African employees have an impact in employee productivity. The authors find that this is the case, and argue that the mechanism behind is the managers dedicating less management time to employees who they dislike.

Moreover, in order to test if changes in implicit biases against homosexual men translate in changes in discriminatory behavior in the particular case that I study I consider the FBI's hate crimes database, which contains crimes categorized as hate crimes since 1995. In Figure 14 in Appendix B I plot the stacked DID event studies where the dependent variable is the log of the number of categorized hate crimes against the LGBTQ community. The pattern is consistent with the changes in the implicit bias by legalization method. After SSM was legalized, states where this was due to judicial action see an increase in the percentage of hate crimes against the minority group, and states where SSM was legalized through the legislature see a considerable decrease in hate crimes even only four years after the law change. I am aware that there are a couple things to point out to take these results as merely suggestive. First, looking at the pretrends for both groups it appears that legalization-through-the-judiciary states had increases in hate crimes before SSM legalization, while the opposite is true for legalization-through-the-legislature states. Second, many NGO and even the FBI consider that there is heterogeneous underreporting of hate crimes across states.[7] Nonetheless, I consider that the fact that there is a consistent pattern between the differences in the SSM legalization method and different measures of discrimination, either implicit or explicit, strongly suggest that these results are robust.

I consider the results presented in this subsection shed light on the Constitutional Law debate regarding the unintended consequences of judicial activism, which in turn sheds light on the heterogeneous (social) costs of different ways of achieving the same

[7] https://www.propublica.org/article/why-america-fails-at-gathering-hate-crime-statistics

(normative) goal: the legalization of SSM. According to Siegel (2017), opponents of SSM in the U.S. argued that even if there was a case for recognizing it, in a constitutional democracy that question is up for determination by legislatures, not courts. On this note, as I previously mentioned, in the landmark SCOTUS case *Obergefell v. Hodges*, Chief Justice Roberts insisted that SSM had an undeniable appeal, but argued against making it the law of the land through a ruling as the SCOTUS is not a legislature.

Professor Siegel has made one of the most convincing cases for the irrelevance of the backlash question. She argues that the backlash framework is misguided as it evaluates these judicial decisions within a short time horizon, but when analyzing a longer time horizon the "constitutional understanding" of these issues shifts and hence what is labeled as backlash in the short term, in the longer term is just part of the transformation of the "constitutional culture". For instance, she argues that SSM is now outside the scope of the public debate but other considerations such as the denial of private services to LGBTQ populations based on religious freedoms have taken its place. Put differently, the courts are not putting an end to the contestability of LGBTQ issues, which only society in coordination can decide, but just changing the terms of the debate. While this may be an interesting claim regarding the nuances of the social norm shifts, it does not relate to what most of the literature understands as backlash. Under Bishin et al. (2016)'s definition, which is testable, Figure 5 results counterargue Siegel's claims of a lack of backlash.

Making a weak case for the external validity of these results, let us consider the Colombian case. The Colombian Constitutional Court (CCC) might be, to my knowledge, one of the most active constitutional courts in the world advancing in the recognition of rights of sexual minorities. Andrade-Rivas and Romero (2017) mention that as of 2013, the CCC had issued 70 rulings in favor of freedom of expression and personal development with regard to LGBTQ rights, as well as had both legalized same-sex unions and their right to adopt by 2015. Bocanumenth (2021) reports how even though on paper the country has one of the strongest legal frameworks in Latin America defending the rights of LGBTQ populations (mostly due to judicial decisions), in practice these protections are rarely enforced. This lack of effective protections might reflect Baca et al. (2019)'s findings that out of nine countries in Latin America and the Caribbean, Colombia registered the highest number of killings of LGBTQ people over 2014 – 2019.

Normatively, I cannot be more certain that sexual minorities ought to have equal rights. However, the road towards this *ought to be* state of the world might be smoother when guided by positive findings. If there is empirical evidence suggesting that SSM legalization via the judiciary might be counterproductive, instead of turning a blind eye on it, it begs the question of what are the underlying mechanisms explaining this result. Then, more research following this line of though would not only be interesting, but useful in shedding light on how to advance towards a more equal society.

6.2 Economic outcomes

In order to analyze the effects of same-sex marriage legalization on economic performance, I start by replicating one of Black et al. (2007) findings, that male workers in same-sex couples concentrate in occupations with a higher share of women relative to men in different-sex couples, and testing for a mediating effect of SSM legalization. Using data from the 2000 Census, that reflects a point in time when SSM was illegal in every U.S. state, and data for the 2016-2019 ACS, that reflects a point in time when SSM was legal in every U.S. state, I estimate the Linear Probability Model expressed by 5 where $\mathbb{I}NAICS_i^{>50\%women}$ is an indicator variable that activates when the NAICS industry where individual i works is conformed majoritarily by women. $\mathbb{I}Gay_i$ is an indicator variable that activates if individual i is in a same-sex couple relationship; and $\mathbb{I}Judiciary_i$ is an indicator that activates if the SSM legalization method in state where individual i lives was through the judiciary.

$$\mathbb{I}NAICS_i^{>50\%women} = \beta_0 + \beta_1 \mathbb{I}Gay_i + \beta_2 \mathbb{I}Gay_i \times \mathbb{I}Judiciary_i + \varepsilon_i \tag{5}$$

Table 3 shows the results for the LPM using robust standard errors. According to these results, men in a same-sex couple that lived in a state that legalized SSM through the legislature were 12 percentage points more likely than men in a different-sex couple to work in an industry where the majority of workers are women in 2000, and 11.6 percentage points more likely to work in these industries in 2016-2019 (using industry shares from this period), so their likelihood *decreased* by 0.4 percentage points. This contrasts that, in states where the method of SSM legalization was through the judiciary, their likelihood to work in an industry where women are a majority, relative to men in different-sex couples, *increased* by 2.4 percentage points considering the same time-frame.

Table 3: Increased likelihood of gay men's working in NAICS industries where the majority workers are women.

	Pre	Post
(Intercept)	0.321***	0.346***
	(0.001)	(0.001)
Gay men indicator	0.120***	0.116***
	(0.004)	(0.004)
Judiciary indicator	-0.029***	-0.010***
	(0.001)	(0.001)
Gay men x Judiciary	0.010**	0.018***
	(0.004)	(0.005)
Num.Obs.	2340145	1515498

Post uses the same information, but considers the 2016-2019 ACS.
Pre uses information for men that are reported as in a relationship in the 2000 Census.
Robust standard errors in parentheses.

The fact that post SSM legalization men in same-sex couples concentrate more in industries where the majority of workers are women in the states that legalized through the judiciary is indicative of a higher degree of discrimination, as research shows that they tend to work in less stigmatizing industries, and the literature seems to point out that all else equal, these industries are the (heterosexual) male-dominated ones. I test this idea in terms of homosexual vs heterosexual male worker segregation using Model 4.

The impact of SSM legalization on $D_{j,t}^{Ind}$ and $D_{j,t}^{Occup}$ is also mediated by the method of legalization, I show this in Figures 6 and 7, respectively. In both cases, the parallel trends assumption seems to hold, in particular for the judiciary case as the pre-treatment coefficients are concentrated around zero and the standard errors are smaller than in the legislature case. The results suggest that SSM through the judiciary resulted in an increase in labor market segregation of homosexual men.

In the industry case, states that legalized SSM through the judiciary are, on average, 0.074 index points more segregated than they would have been if they did not legalize SSM through this method. To set things in context, this is more than 13% of the nation-wide segregation average throughout the period. It is also a significant amount considering that the dissimilarity index ranges from 0 to 1, 0 being the case where there is no segregation, and 1 being the case where there is complete segregation. The (opposite) effect seems to be more readily apparent in states that legalized SSM through the legislature: four years after legalization, the dissimilarity index decreased, on average, 0.12 index points.

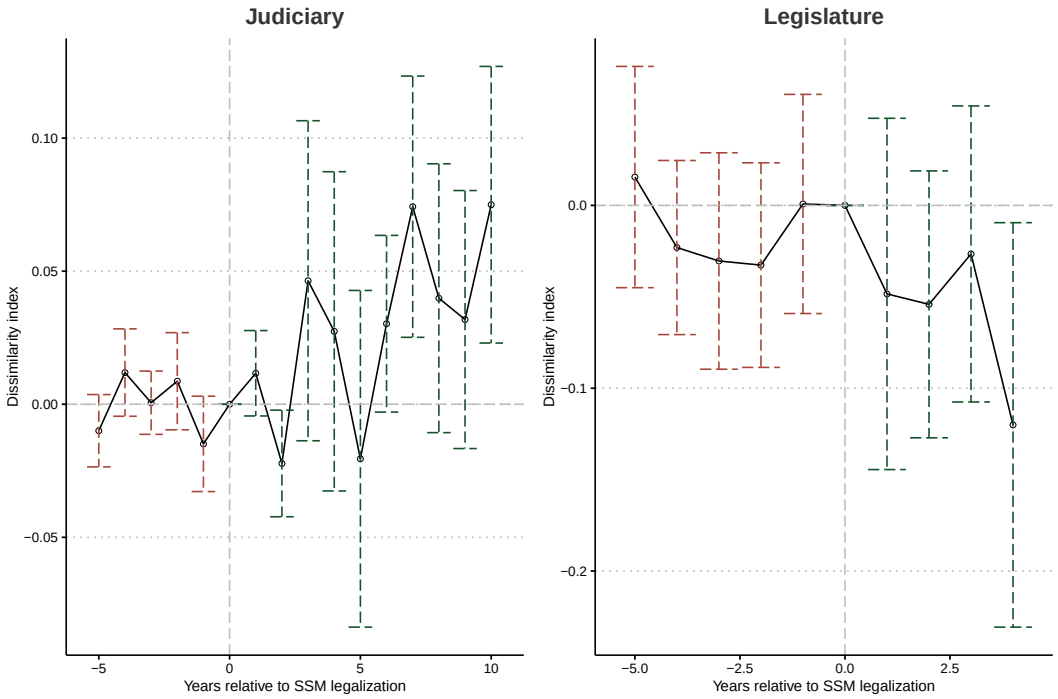

Figure 6: Event study by legalization method using stacked regressions. $D_{j,t}^{Ind}$, dissimilarity index of industries, as dependent variable.

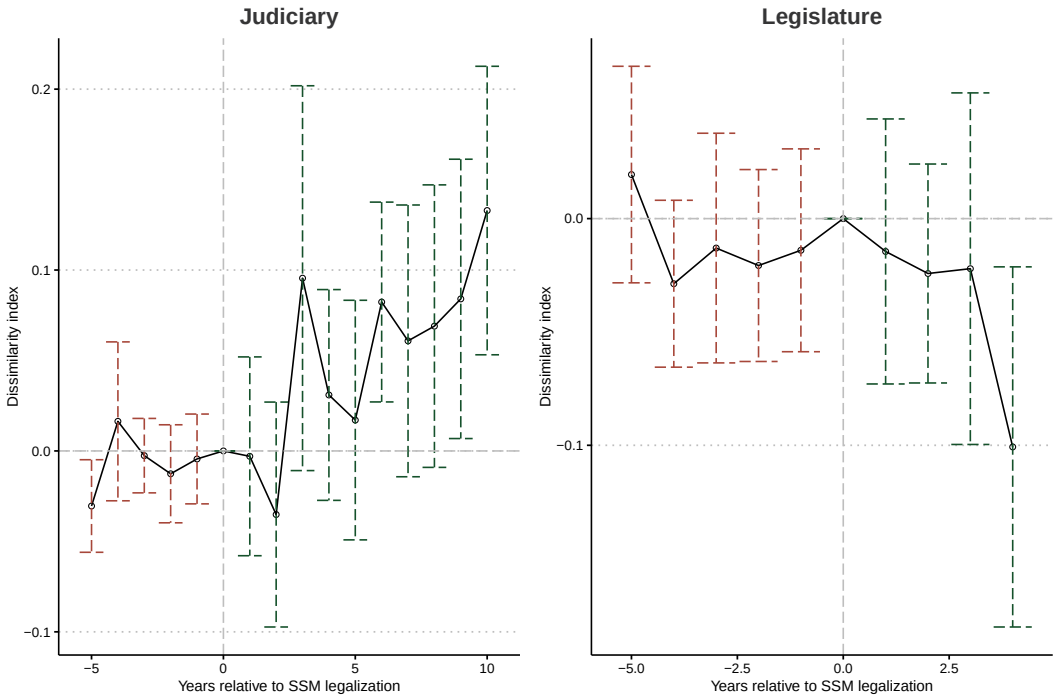

Figure 7: Event study by legalization method using stacked regressions. $D_{j,t}^{Occup}$, dissimilarity index of industries, as dependent variable.

The effects on occupational segregation are of greater magnitude, especially considering that there is less variance in the respective dissimilarity metric. In states in the judiciary case, segregation increases by 0.13 index points ten years after SSM legalization, which is almost half of the segregation level of California. In states in the legislature case, segregation decreases by 0.10 index points.

As Hsieh et al. (2019) show, segregation in the labor market can have pernicious effects in the economic performance of industries and even countries through the channel of misallocation of resources. The authors demonstrate that the effects are large in the case of women and blacks. While sexual minorities take up a small share of the population, it is possible that their labor market segregation also has a considerable impact, given that the amount human capital they tend to accumulate. More research needs to be done to provide a definite answer about the existence of this relationship, but I consider it to be an understudied area in Economics with potential of growth.

7 Concluding remarks

Do all same-sex rights are created equal? My research, using a measure of implicit bias for anti-gay attitudes, suggests that this is not the case. The literature of public opinion changes due to SSM remains far from settled. I hypothesize that this is mainly due to the lack of considering heterogeneities. More recent research does place more weight on these potentially different effects via method of legalization. Aksoy et al. (2020), published the most recent study on the topic, contributing to bridging this gap as the authors' main focus is to test for differentiated effects of SSM across demographies. Having a better understanding of the different channels through which social norms shift, means more and better tools to keep moving forward. Normatively, one can agree that more equal rights for sexual minorities imply a Pareto improvement in society. The small print is that there are more and less effective ways to get there, whilst some may end up being counterproductive. Even more so, as this research provides suggestive evidence that some of these ways have real effects on the economy.

A note of caution. It is easy to make generalizations whether some policies are "good" or "bad" using reduced form estimates, as the ones used in this paper. However, it is important to emphasize that these are only partial equilibrium findings. For instance, Seror and Ticku (2021) find that the effect of SSM on enrollment in priestly studies fell after legalization of SSM for both methods of legalization. The decrease in enrollment is actually higher for states that legalized it through a court order. The authors attribute these findings to a decrease in the cost of coming out, hence, making marginal enrollees better off. With this in mind, the net effect of SSM on sexual minorities' well-being in states that legalized it through the judiciary is not clear.

More and better research regarding minorities help us build a fairer and more equal

society. This research is my attempt to contribute towards this goal.

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A Google Trends estimation for non-reported values

Google Trends is a great source for retrieving high quality data that, in my view, has been underused for social science research. It provides insights that survey data are not likely to deliver. Most surely, if the research topic carries some taboo weight. Still, its main downside is Google's unreported absolute threshold that, when crossed, yields zeros in its index.

Using Stephens-Davidowitz (2014) algorithm idea of considering an auxiliary search term that most likely yields an index above the threshold such as "weather" or "food", the threshold problem can be overcome almost entirely.

The idea is that if term "M" does not cross the threshold for many observations, one can search for "$M + A$", where "A" is the auxiliary term to get above this threshold. Then, if the raw volume search were provided, the solution would be to simply subtract "A" from "$M + A$".[8] As this is not the case, complications arise from sampling, rounding and normalizing. The first two are solved by constantly retrieving samples.

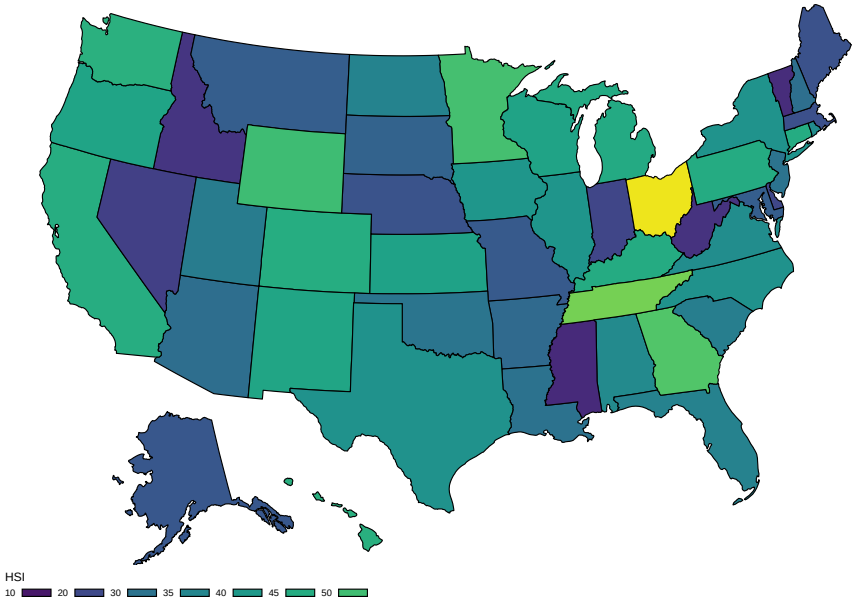
In order to get a normalized search index that is comparable across time and geos I obtain data for each geographical area plus data at the national level and renormalize each area by $maxIndex_s/maxIndex_{U.S.}$, as suggested by Paul Goldsmith-Pinkham (2020).

Once the index is scaled, I compute Model 6, where B is the set that contains positive values for all three queries but below the maximum, 100. γ_g is a geo fixed effect. In the results from regression 6, I get that α_0 is positive and α_1 is negative, which is consistent with the idea of subtraction mentioned above. I then use these coefficients to predict the observations that have zeros reported.

It is worth noting, that the share of the predicted observations decreases as the sample size increases. As of the closing of this document, the share of predicted geo-month observations and number of samples used is 6.9 percent and 39, respectively. The analysis conducted throughout this paper was at the geo-year level.

$$M_{b \,\epsilon\, B} = \gamma_g + \alpha_0 (M + A)_{b \,\epsilon\, B} + \alpha_1 A_{b \,\epsilon\, B} + \varepsilon \tag{6}$$

[8] For details, see Stephens-Davidowitz (2014).



Note: I consider the search volume of "sodomy", "gomorrah", "leviticus", and "adultery" throughout 2004 and 2019, I scale it as explained in Appendix A, and take the state average.

Figure 8: Alternative HSI

B Additional figures and tables

Table 4: Top occupations with the highest share difference between heterosexual and homosexual men

Occupation name	Difference in occupation-indentity share
Construction	0.05
Transportation and Material Moving	0.04
Installation, Maintenance, and Repair	0.03
Production	0.03
Protective Service	0.01

Notes: The difference represents the distributional differences between both groups. I consider the average differences across states between 2000 and 2019. In order to have a set of occupations that is comparable across time I consider the occupation variable homologated to 1990 as there is no more recent standardization.

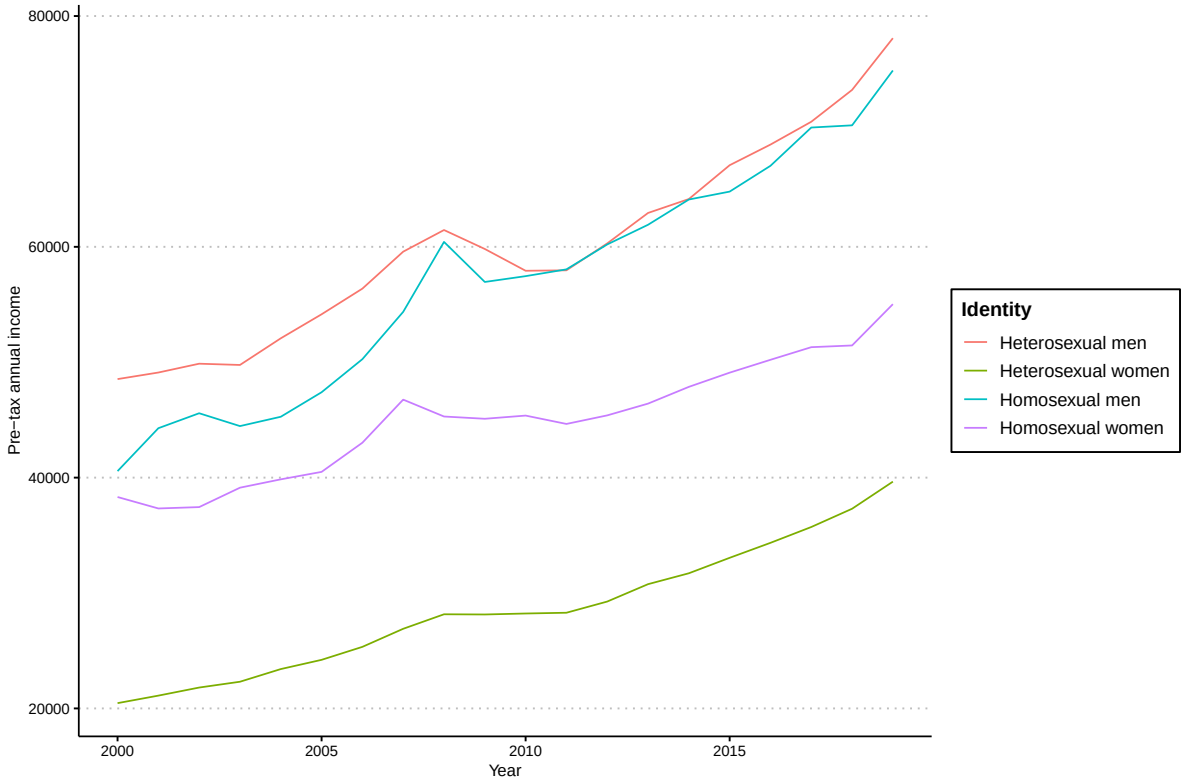


Figure 9: Time series of the pre-tax annual income identity-average

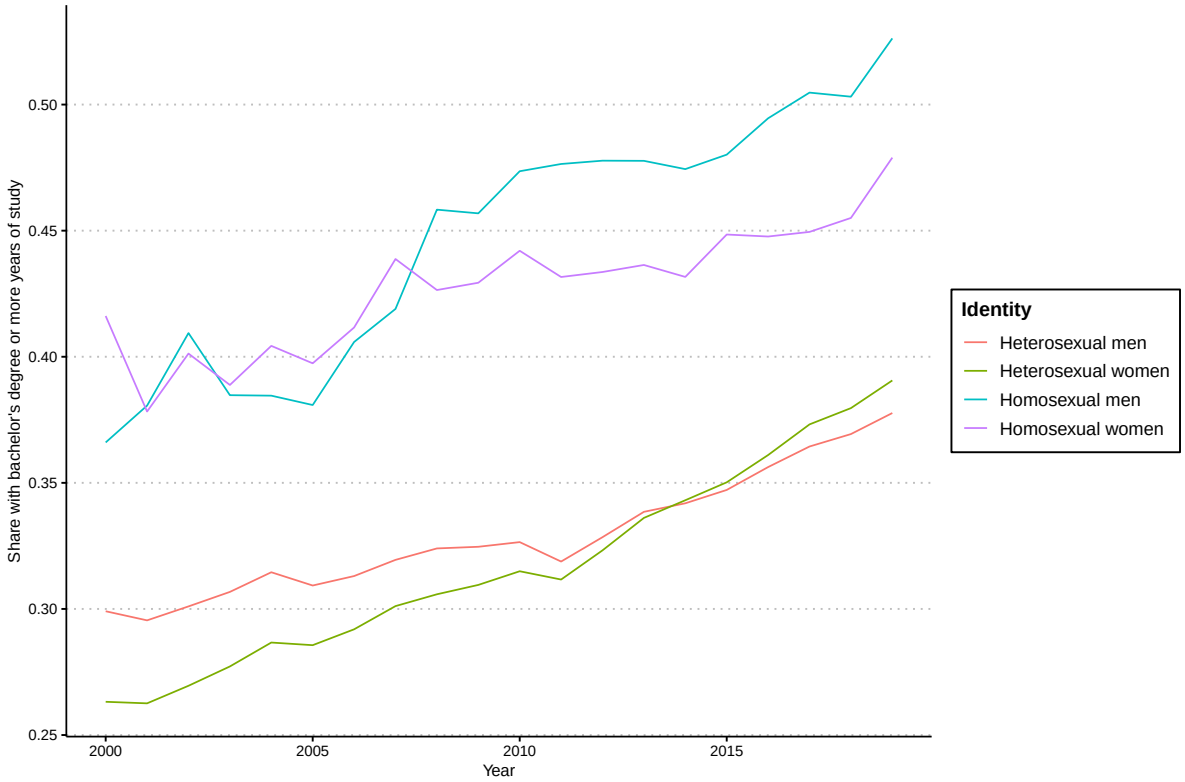


Figure 10: Time series of the identity-share with bachelor's degree or more years of study

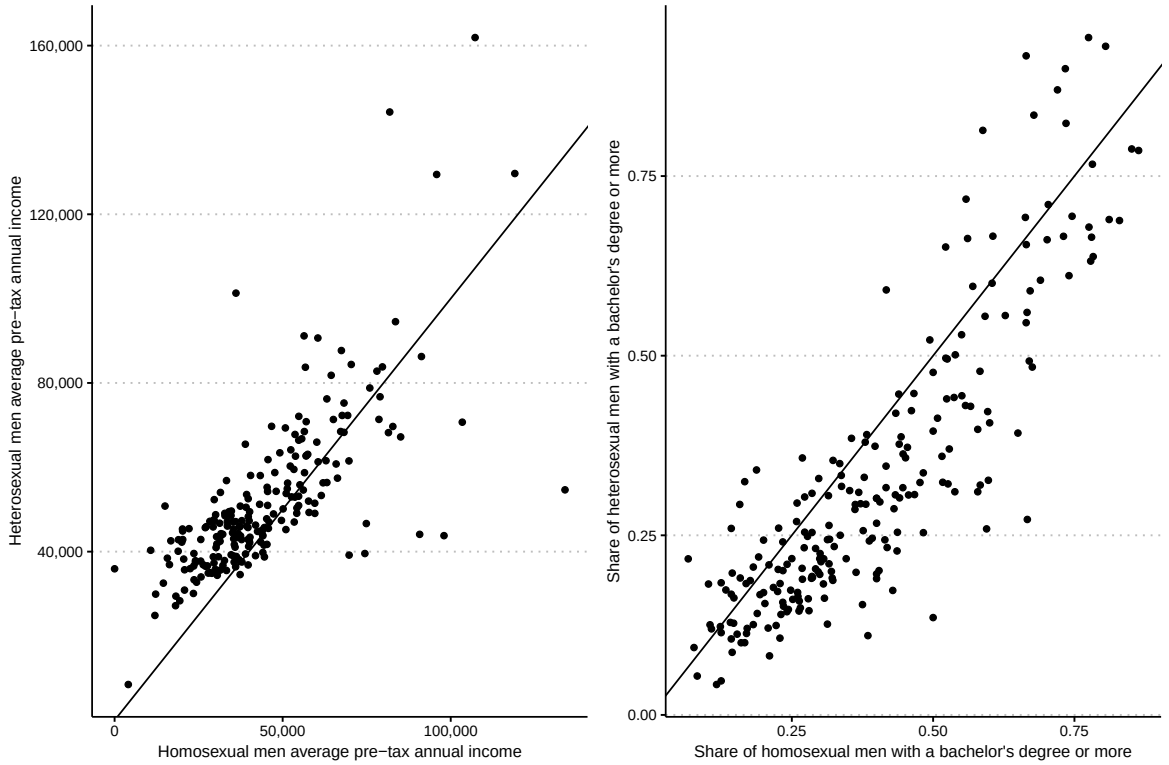


Figure 11: Industry averages of pre-tax annual income and worker shares with a bachelor's degree or higher

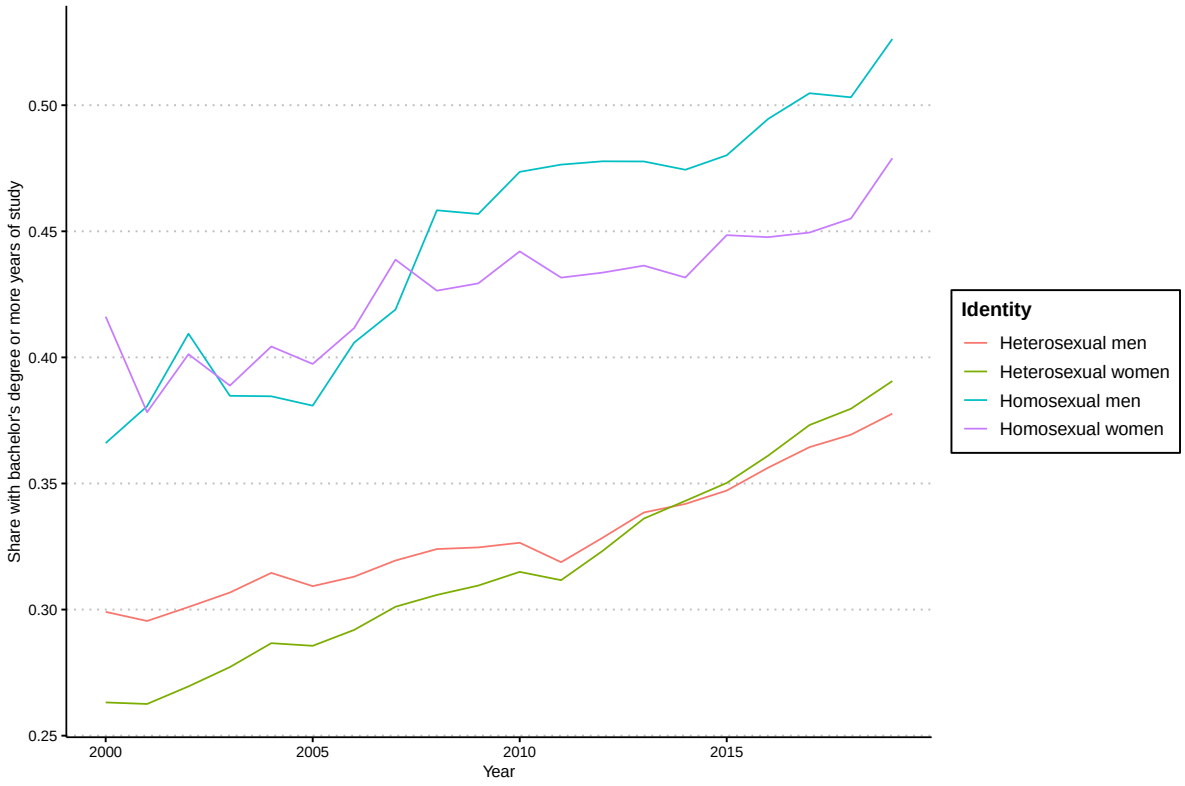


Figure 12: Time series of the identity-share with bachelor's degree or more years of study

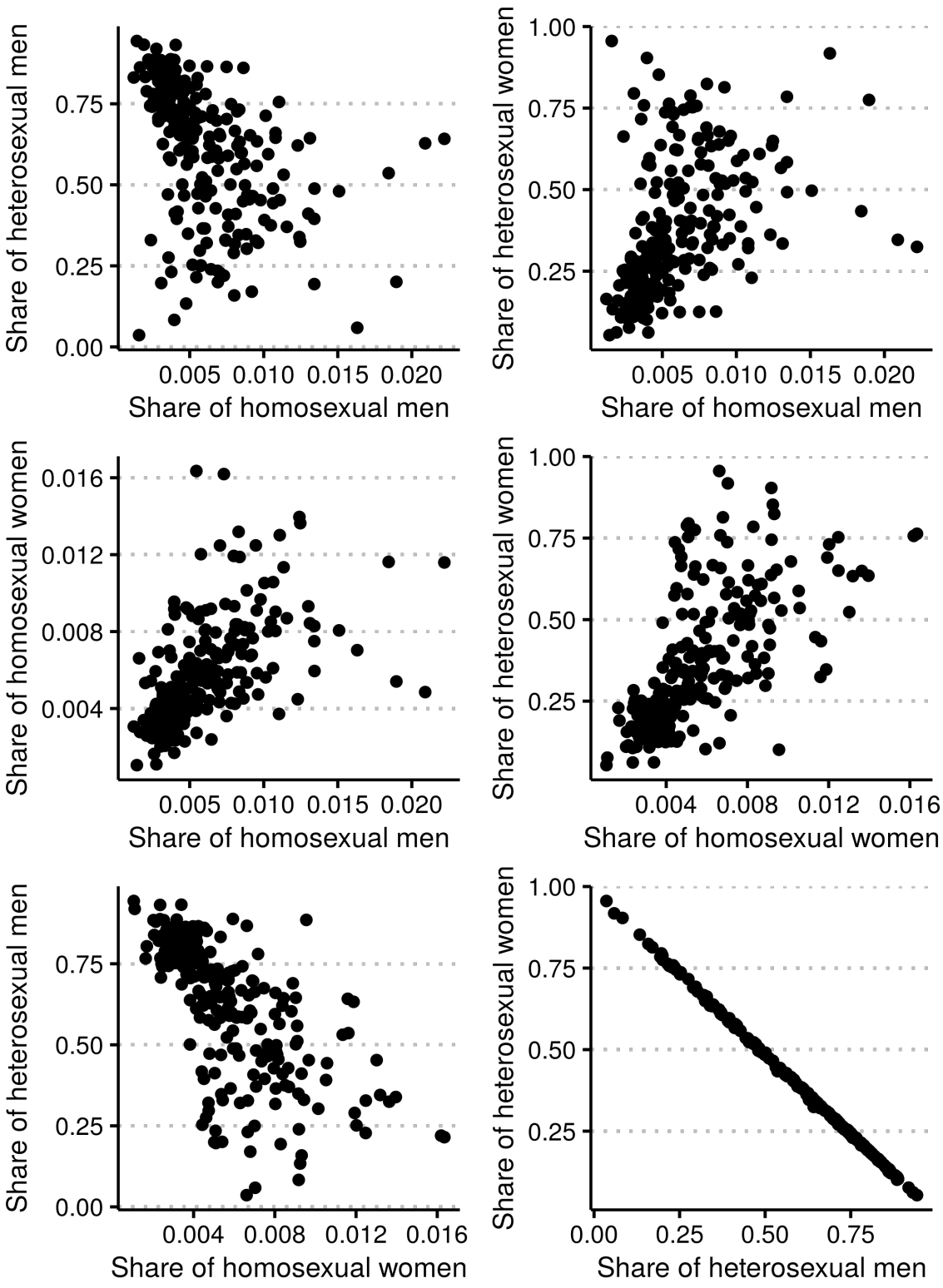
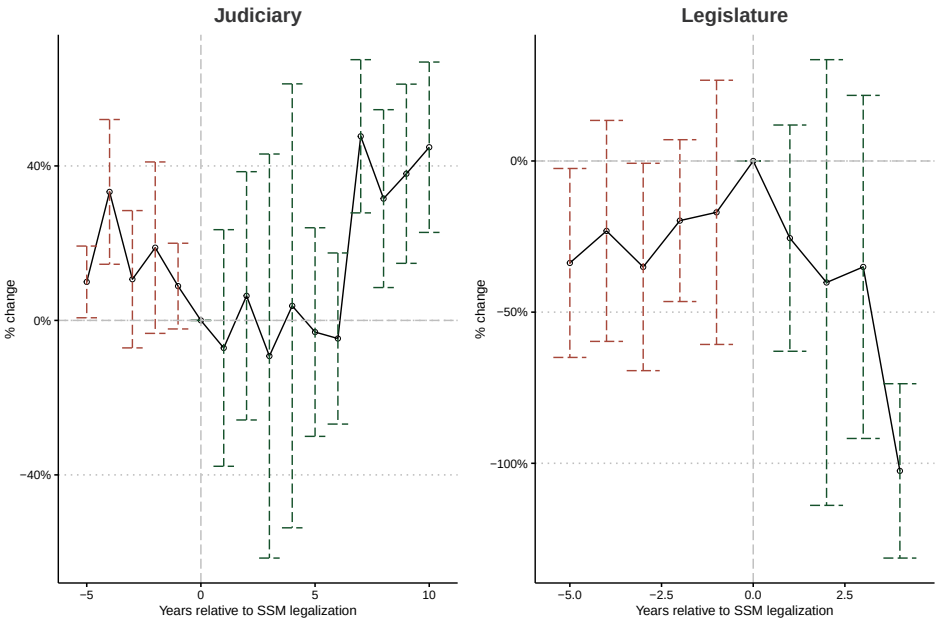
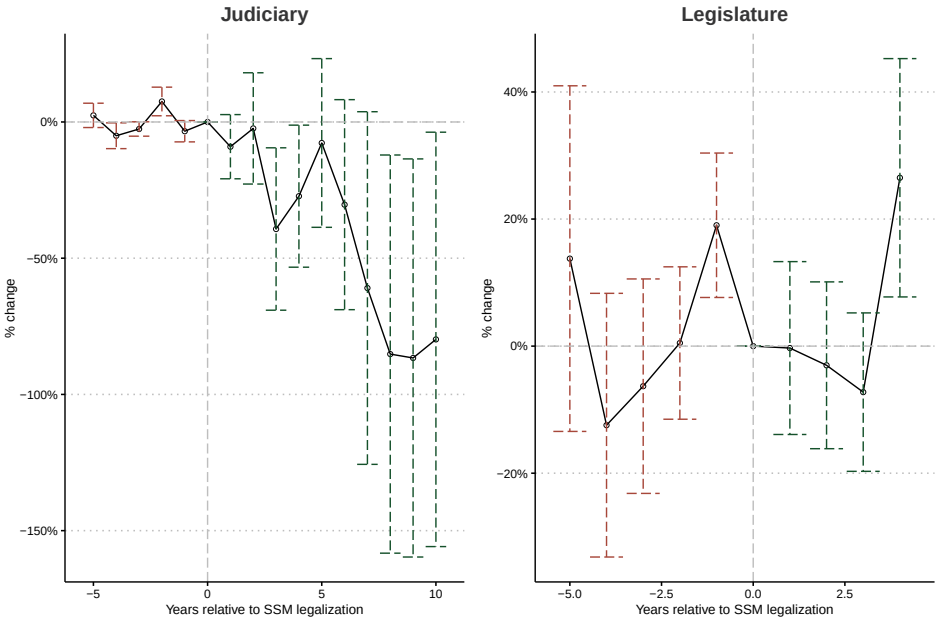


Figure 13: Industry shares correlations by behavioral sexual identity



Note: Using the public compiled dataset of hate crimes from the FBI. I count the hate crimes at the state-year level that are coded as motivated by an "Anti-gay", "Anti-lesbian", "Anti-bisexual" or "Anti-transexual" bias.

Figure 14: $log(No.\, LGBTQ\, hate\, crimes)$ DID event studies relative to SSM legalization through the judiciary.



Note: Using the public Sexuality IAT dataset from 2004-2019. The possible range of the implicit biases measure is [-2,2], -2 signifying the most negative bias against sexual minorities and 2 signifying the most positive bias about sexual minorities. I consider the average implicit bias change at the state-year level.

Figure 15: IAT implicit bias change rate DID event studies relative to SSM legalization.