Changes in implicit bias, discrimination and economic growth: Evidence from the legalization of same-sex marriage

Vicente F. Guerra Ochoa

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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. These changes in homonegative sentiment likely had an impact on economic performance. Building on Black et al. (2007)'s finding that homosexual men tend to crowd-out in industries where most workers are (heterosexual) men, as they might experience more discrimination, I construct a variable of the chained GDP of the five industries that have the highest share of men, by state. I find evidence suggesting that 10 years after SSM legalization via the judiciary, this GDP measure was 23.93 percent lower, had SSM not been legalized that way. I argue that an increased misallocation of homosexual male workers might have driven this worsened economic performance. Whilst normatively sexual minorities ought to have equal rights, there may be more and less effective ways to achieve this goal.

*This writing sample is based on my undergraduate honors thesis. I am currently revising my honors thesis in aims of turning it into a working paper and intend to reflect these changes in the writing sample.

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 economic performance.

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.[1] 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 economic performance of the industries where discrimination is more likely to be prevalent and hence so does misallocation.

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

[1]The work most closely related does not consider this potentially differentiated impact of SSM. Kreitzer et al. (2014), Bishin et al. (2016) and Flores and Barclay (2016) either focus on a single jurisdiction or do not test for heterogeneous impacts. Ofosu et al. (2019) is the work most closely related but they use a rather biased proxy for discrimination.

legalizing SSM through the judiciary leads to *increased* levels of homophobic attitudes measured through the volume of google searches of the homophobic epithet. Legalization through the legislature generates the opposite pattern and I find *decreased* homophobic attitudes in the following years. Based on these results, I test for a differentiated economic performance of the industries more likely to be misallocated regarding homosexual men. I find that states where SSM was legalized through the judiciary, and hence had an increase in homophobic attitudes had a *decreased* economic performance in the potentially more discriminatory industries. On the contrary, states where SSM was legalized through the legislature had an *increased* economic performance in the same industries.

The remainder of the paper is organized as follows. Section 2 gives a brief background of the motivation of this study. Section 3 lays down the data used. Section 4 discusses the empirical strategy. Section 5 shows the results, and Section 6 concludes.

2 Background

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). Between 2004 and 2015, eleven states and D.C. legalized SSM through their local legislatures, in twenty-four it became legal through a federal court order, and in the remainder fifteen it became legal due to *Obergefell v. Hodges*.

Constitutional Law theory, and specifically the *judicial backlash thesis*, suggests that whereas legalization via the legislature would lead to a positive shift in attitudes towards LGBTQ populations, legalization through the judiciary may lead to backlash. 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.

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. Most of the studies in this area are correlational. For instance, focusing on homosexual men, Lamontagne et al. (2018) constructs a measure of homophobia at the country level and with it, find negative social, economic and health associated consequences of homophobia in low- and middle-income countries. They find that a 10 percent increase in GDP per capita is associated with a 1 percentage point reduction in the mean of his homophobic climate index. My research aims to bridge the gap between the correlational evidence and finding causal evidence.

Following Hsieh et al. (2019), the mechanism that likely drives the economic effects of discrimination in the case of sexual minorities is that of misallocation of human capital. High-skilled sexual minorities might be driven out of industries or occupations where their marginal productivity is higher than that of the average worker. Plug et al. (2014) documents that LGBTQ workers tend to sort into tolerant occupations through the comparison of twins with different sexual orientations, gays, lesbians and bisexuals were less likely to work in occupations with prejudiced workers, which are not necessarily where they have the highest productivity.

In a similar fashion, Black et al. (2007) documents that homosexual male workers in male same-sex couples were in occupations with a higher proportion of women than workers in different-sex couples. Building up on this fact, Sansone (2019) tests if same-sex marriage legalization induced a shift of minority workers towards historically tolerant occupations (or to disclose their sexual orientation if already employed in these sectors). He finds that the probability of being employed in an occupation with a majority of female workers decreased by 1.4 percentage points after same-sex marriage legalization. This suggests that homosexual men do change their industry and occupation sorting after changes in discrimination. A downside of his study is that he does not consider the potentially differentiated effects depending on the method of legalization.

3 Data

3.1 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, "fagot" and "fagots" for every US state plus D.C. between 2004 and 2019.[2] 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 $\frac{maxIndex_s}{maxIndex_{US}}$.

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

[2]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".

"weather" as a control.

3.2 Potentially misallocated industries

Table 1: NAICS industries with the top 5 shares of men in 2000. (U.S.)

NAICS Industry	Pre	Post
Construction	89.90	89.08
Mining, Quarrying, and Oil and Gas Extraction	87.31	84.84
Agriculture, Forestry, Fishing and Hunting	78.78	76.01
Utilities	77.04	77.13
Transportation and Warehousing	73.39	73.86

Post uses information from the 2016-2019 ACS, when SSM was legal in every state.

Pre uses information from the 2000 Census, when none of the states had legalized SSM.

In order to test for the economic effects of changes in discrimination I construct a variable of the sum of the top five industries with the highest share of men previous to same-sex marriage legalization in any state, at the year and state level: $GDP_{j,t}^{Top5j,2000}$, which is represented synthetically by Equation 1. In other words, it is the sum of the five industries k with the highest share of men in 2000 in state j, for every state j and year t. By considering the industries with the highest share of men during 2000 I avoid any endogenous impact that SSM could have on worker-gender composition. Interestingly though, these industries did not change from 2000, when SSM was not legal in any state, to 2019, when SSM was legal across the U.S.

$$GDP_{j,t}^{Top5_{j,2000}} = \sum_{k \,\epsilon\, Top5_{j,2000}} GDP_{k,j,t} \tag{1}$$

In order to calculate male-worker shares at the industry-state-year level as well as demographic controls for my analyses, I use the American Community Survey (ACS) between 2000 and 2019. To compute state level variables I use the full sample which consists of 51,401,670 observations. To compute the share of same- and dfferent-sex couples, which I use as controls I only keep observations for individuals aged between 18 and 65 and their married or unmarried partners.

Specifically, the state-level controls used through this paper are: i) share of same-sex couples; ii) share of unmarried different-sex couples; iii) share of adults between 18 and 35 years old; iv) share of people with 4+ years of higher education; v) share of adults between 18 and 65 that are employed; vi) the average total pre-tax personal annual

income or loses; vii) proportion of the population that is black; and viii) proportion of the population that Hispanic.

For the GDP data at the state level I download data from the U.S. Bureau of Economic Analysis (BEA) for every year from 2000 to 2019. The GDP data is disaggregated by state, year and NAICS industry. I consider the chained GDP to focus on real changes.

4 Empirical Strategy

Staggered rollout 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 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 described in Section 3, plus the constructed search index for weather.

$$log(GDP_{j,t,G}^{Last5_{j,2000}}) = \gamma_{j,G} + \tau_{t,G} + \overline{X}_{j,t,G} + \sum_{k \neq 0} \delta_k \mathbb{I}[t - G_j = k] + \varepsilon_{j,t,G} \tag{4}$$

Model 4 is the specification I use to test, indirectly, if same-sex marriage had an effect on economic performance, considering the channels laid by Hsieh et al. (2019). Recall that $GDP_{j,t}^{Top5_{j,2000}}$ is the sum of the five NAICS industries with the highest share of men in 2000 by state j and year t. I consider its log to have an approximate percentage change interpretation of the results. $\overline{X}_{j,t,G}$ only includes the set of controls described in Section 3.

5 Results

Figure 1 shows the 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. The first thing to note from Figure 1 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 after SSM legalization, this search index is 36.06 and 35 percent higher than the year SSM was legalized, respectively. The opposite is true for the states that legalized SSM through the legislature, but the change seems to happen at a faster rate. 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.[3]

[3]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 $\%y = 100(e^{\beta} - 1)$ 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.

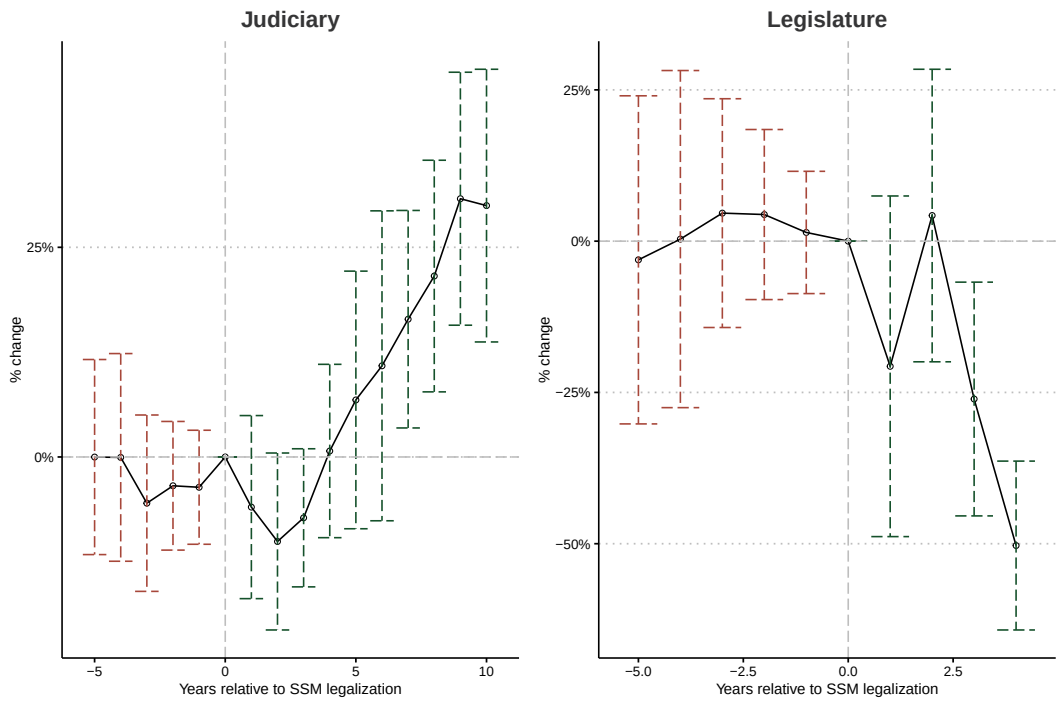

Figure 1: Event study by legalization method using stacked regressions. $log(HSI)$ as dependent variable.

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.

I am aware that more research needs to be done to conclude confidently that a(n) decrease (increase) in the HSI translates into an decrease (increase) in discrimination against sexual minorities, or at least against LGB people. Assuming that the HSI is a good proxy for homophobic discrimination, I estimate Equation 4. Again, the logic behind it is that for states that legalized SSM through the judiciary and saw an *increase* in discrimination against homosexual men, there would be an increased misallocation of human capital as homosexual men crowd-out already discriminatory industries. I hypothesize here that the men more likely to crowd-out are high-skilled, as they face

smaller transaction costs, and at the same time would be the ones who affect the most the productivity of the industries that they leave. This is a testable hypothesis and is the direction that the work presented in this working sample is taking.

The opposite but symmetric mechanism would be behind states that legalized SSM through the legislature and saw a *decrease* in discrimination against homosexual men. The misallocation of human capital would decrease as high-skilled homosexual men move to previously-less-welcoming industries.

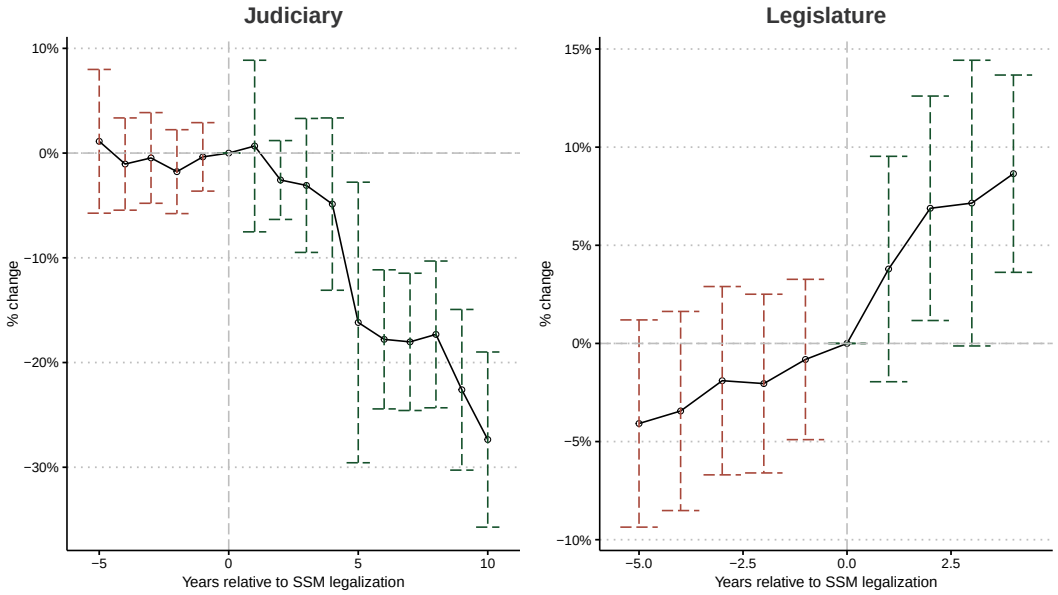

Figure 2: Event study by legalization method using stacked regressions. $log(GDP_{j,t}^{Top5_{j,2000}})$ as dependent variable.

Figure 2 plots the event-study coefficients for Equation 4. In line with the changes in the HSI, the NAICS industries with the highest share of men saw a decrease in their chained GDP by 23.93 percent ten years after SSM legalization in states that legalized SSM through the judiciary. While the states that legalized through the legislature exhibit the opposite pattern, the parallel trends assumption seems more implausible to hold as the point estimates exhibit an upward trend, even if they are not statistically significant.

6 Conclusion

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. 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.

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