

RESEARCH ARTICLE

Mental health effects of same-sex marriage legalization

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Abstract

Same-sex marriage legalization (SSML) is a typical anti-discrimination policy to remove institutional discrimination against sexual minorities by providing them with marriage equality. We examine how this legalization in the Netherlands affected mental health. Conducting a difference-in-differences analysis with heterosexual individuals as a reference group, we find that SSML significantly improved mental health of sexual minorities and substantially reduced the sexual orientation gap of mental health. The beneficial effects were present for both married and non-married sexual minorities. This phenomenon suggests that part of the health gains were related to mechanisms beyond marriage itself.

KEYWORDS

institutional discrimination, mental health, same-sex marriage, sexual minorities

JEL CLASSIFICATION

I12, I18, J12, J15, K36

1 | INTRODUCTION

According to recent estimates, in 2017 worldwide 971 million people had mental health problems (GBD 2017 Disease and Injury Incidence and Prevalence Collaborators, 2018). Among them, 264 million suffered from depression (of which 163 million suffered from major depression) and 284 million had anxiety disorders. Such mental health problems exhibit for both genders and across all age groups with substantial differences in causes, locations, and so on. Mental disorders may cause important adverse individual economic performances including reducing employment and thus income.

Our study focuses on mental health divergence in sexual orientation. Sexual minorities have higher levels of psychological distress than heterosexuals on average (Wight et al., 2013). This mental health gap may be attributed to either

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actual or perceived discrimination and unfair treatment against sexual minorities. A hostile and stressful social environment for sexual minorities causes mental health problems related to stigma and prejudice (Meyer, 2003). Although the extent of discrimination against sexual minorities is varying across countries and regions, there is no doubt about the existence of this type of discrimination. In addition to discrimination in the labor market (Ahmed et al., 2013; Bertrand & Duflo, 2017; Coffman et al., 2017; Neumark, 2018; Plug et al., 2014; Sansone, 2019), sexual minorities have been confronted with other kinds of discrimination such as that in housing (Badgett et al., 2021). For a long time, homosexuality was considered to be a disease. The World Health Organization, for example, published the International Statistical Classification of Diseases and Related Health Problems (ICD) in 1948 in which homosexuality was classified as a mental disorder. It was not until the 1970s that homosexuality was removed from the ICD (see www.who.int/news-room/spotlight/international-classification-of-diseases). Same-sex relationships were against the law in many countries in the past, and they still are in some countries nowadays.

However, opinions about same-sex relationships have been gradually evolving. As part of structural changes in partnership formations and family institutions, countries around the world have started to accept and formalize same-sex relationships to the extent that some of them even legalized same-sex marriages.¹ Same-sex marriage legalization (SSML) is a typical anti-discrimination policy to remove institutional discrimination against sexual minorities by providing them with marriage equality. Such a marital policy reform may help to mitigate mental health issues of sexual minorities to some extent.

Our study aims to establish whether SSML indeed improved mental health of sexual minorities and hence shrank the sexual orientation gap in mental health. We exploit the 2001 SSML in the Netherlands as a natural experiment to compare corresponding changes in mental health between sexual minorities and heterosexuals. Following the literature (see Ridley et al., 2020, for a recent overview of the economics of mental health), we focus on depression and anxiety—two common mental illnesses. In our analysis we use rich administrative micro-data combined with elaborate health surveys from Statistics Netherlands. With precise registered information on individual characteristics and household compositions over the relatively long period 1995–2018, we are able to accurately identify sexual minorities among those ever partnered compared to studies based on surveys only (Carpenter et al., 2021; Raifman et al., 2017). There is a debate in the literature on how to correctly classify sexual orientation of individuals. Our identification of sexual minorities is based on the gender comparison between partners in (recorded) cohabiting couples as well as married couples. Correct classification between sexual minorities and heterosexuals is key to our identification strategy. Nevertheless, there are several issues in the debate. One issue is the use of survey questions on sexual preferences or experiences. Our method of using administrative data on household composition does not allow identification of sexual orientation of singles if they have never been partnered. In theory, using survey questions could have been complementary to our identification strategy. However, we do not have this information and on top of that, survey questions on sexual orientation may not always be answered truthfully (Badgett et al., 2021). We address the identification problem of never-partnered singles through a sensitivity analysis by classifying the always non-partnered individuals as either heterosexuals or sexual minorities. We provide suggestive evidence that these individuals are more likely heterosexuals. Another issue is that sexual orientation is not fixed but there is a potential for sexual fluidity (Katz-Wise, 2015). We follow the literature by classifying individuals who over time were in both same-sex and different-sex relationships, namely people with potential sexual fluidity, as sexual minorities.

We apply a difference-in-differences (DiD) framework to examine the effects of SSML on depression and anxiety of sexual minorities. The treatment group consists of individuals who had at least one same-sex relationship during the period that the administrative micro-data cover. The control group comprises those that formed households with only different-sex partner(s). The main identifying assumption of our design is that SSML did not significantly deteriorate mental health of the control group, that is, heterosexuals. If SSML instead improved mental health of heterosexuals too, then our results would be underestimated and hence become the lower bound of the true effects. Later on, we show that the legalization did not exert significant influence on mental health of heterosexuals.

We find that before SSML, sexual minorities suffered more serious mental health issues than heterosexuals. However, SSML significantly ameliorated their mental health status. Both depression and anxiety of sexual minorities declined and converged to those of heterosexual individuals. We investigate and discuss various mechanisms for the mental health effects of SSML including marriage, marital stability, an enriched choice basket of partnership forms and societal attitude changes. The beneficial mental health effects are present for both married and non-married sexual minorities. Thus SSML did not take effect on mental health through marriage only. Moreover, the legislation stabilized same-sex formal partnerships and enlarged the choice set of same-sex partnership forms, which may contribute to the mental health gains of sexual minorities. Additionally, other indirect channels such as the improvement in societal attitudes to sexual minorities (Aksoy et al., 2020) and self-perception of being socially accepted (Badgett, 2011) probably play an important role.

Our study speaks to several strands of relevant literature. Principally, it adds to the small but growing academic discussion on the relationship between recognition of same-sex marriage-like partnerships and health or health related behavior. Dee (2008) uses country-level panel data from Europe finding that legal recognition of same-sex marriage-like partnerships statistically diminished sexually transmitted infections such as syphilis but not non-sexually transmitted ones. Boertien and Vignoli (2019) study how the SSML introduced in England and Wales in 2014 affected subjective well-being of individuals in same-sex partnerships. Well-being increased irrespective of whether the individuals were in formal civil partnerships or informal cohabitations. The positive well-being effects are attributed to the direct benefit of marriage and the increase in tolerance for same-sex relationships.² Negative mental health effects may occur if the legal recognition of same-sex marriage (SSM) is reversed. Hatzenbuehler et al. (2010) exploit bans of SSM in some states of the United States in 2004 and 2005 to examine changes in psychiatric disorders among adults. With a longitudinal data set, they provide evidence that after the bans, sexual minorities suffered a higher level of psychiatric morbidity. Hatzenbuehler et al. (2012) compare medical care visits, mental health care visits and mental health care costs among around 1200 sexual minority male patients in Massachusetts 1 year before and 1 year after the legalization of SSM in this state. They find significant reductions in these visits and costs regardless of the partnership status. Raifman et al. (2017) exploit variations in SSML across states and time and obtain an association between state SSM policies and a decrease in the rate of suicide attempts among sexual minority high school students. Carpenter et al. (2021) apply a similar design providing evidence that access to SSM raised marriage take-up among individuals living with a same-sex housemate. Access to SSM was also associated with significant increases in health care and insurance usage as well as gay men health. Our study contributes to this literature with our identification of sexual minorities among ever partnered people, which is vital in this literature, thanks to the information on changes in the household composition in our long-period administrative micro-data. Furthermore, with a rich set of questions on mental health as well as other health indicators and health related behaviors, we are able to study various health dimensions.

Moreover, our paper is part of the literature on the positive association between formal partnerships and mental health. Chen and van Ours (2018) conclude that being in a formal partnership improves well-being irrespective of the sexual orientation of the partners involved. Wight et al. (2013) document a similar finding about nonspecific psychological distress in California. In the current study, we find that marriage as a mechanism only partially explains the beneficial effects of SSML on mental health. Other channels including the improvement in societal attitudes toward sexual minorities as well as the increased same-sex partnership stability and the enlarged choice set of partnership forms may also be of importance. Our main finding that SSML substantially shrank the mental health gap between sexual minorities and heterosexuals is in line with Delhomme and Hamermesh (2021) who argue that same-sex couples benefit financially from living under the institution of legalized marriage. They attribute this gain to the couple's increased incentives to invest in their relationship under the greater legal protection of the relationship.

Last but not least, our study is closely related to research on the impacts of anti-discrimination policies. For instance, some countries aim to reduce the gender wage gap by imposing legal requirements for pay transparency. Bennedsen et al. (2020) implement a DiD analysis on the effect of such a law in Denmark valid from 2006 onward for firms with over 35 workers. They document an around 7% decrease in the gender wage gap. Similarly and more prominently, Baker et al. (2019) find that this legislation in Canada on university faculty salaries reduced the gender pay gap by about 30%. Another type of anti-discrimination policies is relevant to anonymity in recruitment. With a field experiment on "blind" auditions at American orchestras, Goldin and Rouse (2000) find that the partly "blind" selection process increased the probability of being recruited for women musicians. Nevertheless, Behaghel et al. (2015) document negative influence of anonymous Curriculum Vitae's (CV's) on probabilities of interview invitations and hiring for minority groups, which was contrary to the intention of the CV anonymity. SSML works as an anti-discrimination policy by removing or preventing steps that disadvantage minorities. This differs from affirmative action policies that require pro-active steps (Holzer & Neumark, 2000). Corneo and Jeanne (2009) present a theoretical framework for the formation of values in which the anti-discrimination legislation has a favorable effect on tolerance. As an empirical example they study the evolution of attitudes to homosexuality in Bulgaria, Poland, Romania and Slovenia. As a consequence of joining the European Union (EU) in 2004, these countries with lower tolerance for homosexuality had to introduce the anti-discrimination legislation protecting the rights of sexual minorities. The authors use the information collected in the World Value Survey in the 1989–1993 and 2005–2006 waves about attitudes to homosexuality. With 19 other countries as a reference group they conduct a DiD analysis showing that tolerance for homosexuality increased more in the four new EU member states than in other countries. Therefore they argue that the anti-discrimination laws led to a favorable shift in attitudes toward homosexuality. Going along with them, the results in our study may provide implications for policies against institutional discrimination in general. We contribute to this literature by investigating the impact of a typical anti-discrimination

policy on well-being of discriminated minorities, through the specific lens of removing discrimination against sexual minorities in the marriage market and examining the corresponding changes in their mental health.

The remainder of our paper is organized as follows. In Section 2 we provide background information about the implementation of registered partnership (RP) and the legalization of same-sex marriage in the Netherlands. Section 3 describes our data and elaborates the information we have about mental health and how we identify sexual orientation of individuals. Section 4 explains our empirical strategy. In Section 5, we present and interpret our empirical findings. Section 6 concludes.

2 | INSTITUTIONAL BACKGROUND

As many other countries, the Netherlands has experienced big changes in partnership formations. In the past decades there emerged two remarkable policy reforms of marital partnerships—the introduction of a formal registered partnership (RP) as an alternative to marriage and the legalization of same-sex marriage. RP introduced on January 1, 1998 has many of the same rights and duties as marriage does in, for instance, tax, property and inheritance (Scherf, 1999). Since the beginning of its implementation, RP has been open to both different-sex and same-sex couples. From April 1, 2001 to March 1, 2009, married couples in the Netherlands were permitted to switch their marriage to an RP. This transition could be followed by a convenient and less costly divorce process without the need to go to court.³ Because such a divorce was not always recognized abroad as a formal divorce and lacked the legal arrangements for children born during the marriage, this so called “flash divorce” procedure was abolished on March 1, 2009.

After being approved in the Dutch parliament by the House of Representatives on September 12, 2000 and the Senate on December 19, 2000, on April 1, 2001 same-sex marriage was legalized (see for details Waaldijk, 2001). Since then “marriage can be contracted by two persons of different sex or of the same sex” (Article 30 of Book 1 of the Dutch Civil Code).

Figure 1 illustrates the developments from 1998 to 2018 of the annual numbers of new formal partnerships, that is, marriage and RP, by sexual orientation and gender. The vertical axis on the left-hand side displays the scale for different-sex couples while the one on the right-hand side shows the scale for same-sex couples. The number of different-sex couples slowly declined from 90,000 in 1998 to about 72,000 in 2013 and increased again to around 82,000 in 2018. For same-sex formal relationships there are two notable peaks—one in 1998 when RP started to be available and the other in 2001 when SSM was legalized. The year 1998 witnessed the formations of 1700 new formal partnerships of lesbian women and 1300 new ones of gay men. These numbers were very much the same in 2001. Apart from the peak periods, every year there were about 2000 same-sex formal partnerships newly formed with slightly more lesbian ones.

3 | DATA

We use data from a health survey to establish mental health conditions of individuals. Through unique individual identification numbers we are able to link the health survey sample to the administrative micro-data which we need to identify the sexual orientation of individuals.

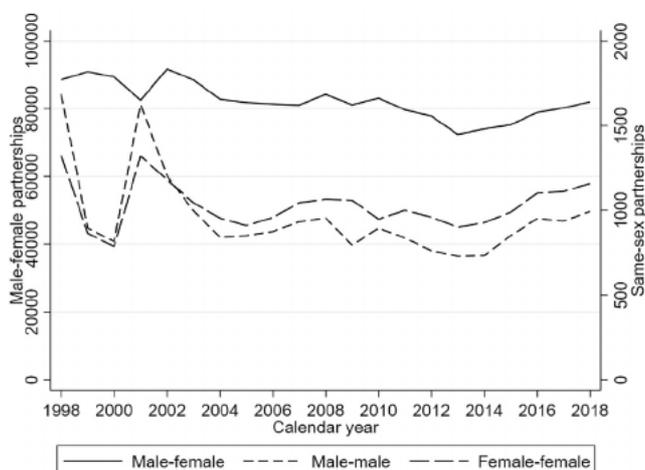


FIGURE 1 Annual new formal partnerships; 1998–2018. Formal partnership = marriage and registered partnership. Source: Statistics Netherlands

3.1 | Sexual orientation

The administrative individual micro-data from Statistics Netherlands cover the whole Dutch population registered from 1995 onward. There is information about personal characteristics such as the country where the person was born, gender, immigrant status, birth year and month. Moreover, the administrative household micro-data include detailed household information over time such as the household type, change in the household composition, and the individual position in the household. Household types are categorized into single person, unmarried couple without children, unmarried couple with children, married couple without children, married couple with children, single parent, institutional household, and other.⁴ Individual positions in the household are classified into partner, single person, parent in the single parent household, children living at home, other member of the household including housemate, member of the institutional household, and reference person in other household. Thus we are indeed able to distinguish a housemate from a partner. The administrative data update accordingly when information on the individual or household changes.

Before assembling the administrative micro-data with the health survey, we have to address a couple of issues. First, we rely on the administrative individual and household micro-data to identify same-sex and different-sex relationships by comparing the gender(s) of the two partners in a household. These relationships can be unmarried ones, that is, (recorded) cohabitation, or married ones including both RP and marriage. Second, in our study, we exploit SSML in the Netherlands as a natural experiment. The treatment group consists of individuals who had at least one same-sex relationship during the administrative data period (1995–2018).⁵ The control group is composed of individuals who during the period 1995 to 2018 formed households with only different-sex partner(s).

Individuals who did not register any relationship during the whole administrative data period are excluded in our main analysis while those who established both different-sex and same-sex relationships are included in the treatment group. This assignment to treatment takes into account the potential sexual fluidity and regards individuals with sexual fluidity as part of sexual minorities (Katz-Wise, 2015). In Section 5.2, we discuss in detail how to classify these individuals with unidentified sexual orientation and conduct robustness checks corresponding to different categorizations.

3.2 | Mental health

The health data are from a module of the Permanent Life Situation Study (POLS) of Statistics Netherlands. POLS is a monthly repeated cross-sectional survey starting in 1997. In every wave (month) 700–1000 individuals, a representative sample, randomly drawn from the Dutch population answered health related questions. Starting in 2001 some of the survey questions on mental health, including depression and anxiety, changed in two aspects: phrasing and response categories. Note that the measurement changes happened from the beginning of 2001 while SSM was legalized in April 2001, so technically we can disentangle their impacts. To connect the most important mental illness variables, depression and anxiety, as smoothly as possible, we re-scaled and standardized these indicators before 2001 and from 2001 onward separately. Specifically, the original responses were re-scaled to the range [0, 1] and then standardized to have a mean of zero and a standard deviation of one for each of the two periods. Appendix A in Supporting Information S1 provides more details on the variable transformations.

For the most common mental illnesses—depression and anxiety, the above standardized measures capture the intensity of these mental problems. In Appendix C3 of Supporting Information S1, we also investigate binary measures of depression and anxiety which capture the prevalence, that is, the proportion in the population who suffers depression and anxiety, respectively. In addition, we study more mental health outcomes and indicators highly relevant to mental health thanks to the rich health related information in the POLS survey. They include nervousness, the frequency of empty feeling, the use of sleeping pills, alcohol consumption and smoking. Sleeping pills, drinking and smoking are often perceived as attempts of (self-)treatment for mental issues. We find beneficial effects of SSML on all these outcomes. What is more, the indicators of feeling empty, the use of sleeping pills and heavy drinking are based on questions that did not change over time. Clearly, the mental health effects documented with these unchanged measures are consistent with the effects on depression and anxiety in our baseline analysis. In other words, the measurement changes do not seem to affect our main findings with respect to the mental health effects of SSML.

We combine the health survey with the administrative micro-data with unique individual identification numbers. We want to avoid the potential contamination of our parameter estimates due to the impacts of the RP introduction on January 1, 1998 and the abolition of the flash divorce on March 1, 2009. Therefore, we discard observations before 1998 and after 2008 from the assembled data. In other words, the estimation of the baseline model is based on a sample from

1998 to 2008.⁶ Furthermore, we drop individuals younger than 16 when they were surveyed since children may not have profound understanding on the issue of SSML.

The age distributions of heterosexuals and sexual minorities are shown in Figure 2a,b, respectively. Clearly, these two distributions are very different. On average, sexual minorities are substantially younger than heterosexuals. Senior citizens are less likely to register a same-sex relationship probably because of higher social and family pressure they have been confronted with. To mitigate the potential misclassification of sexual orientation for senior citizens as well as to introduce more age balance between the treatment and control groups in our baseline analysis, we abandon people older than 55 focusing on young and prime-age individuals.⁷ For model estimation, we use observations with complete information on the outcome and explanatory variables. After the data tailoring, our sample for the baseline analysis comprises 40,586 observations—19,069 observations for males and 21,517 for females; 3671 observations for sexual minorities and 36,915 for heterosexuals.⁸

Figure 3 illustrates the evolution of the averages of our mental health indicators across the period 1998 to 2008 for our estimation sample. The variations in mental health over time consist of three components. First, there are calendar time variations owing to, for example, changing economic circumstances. Second, there is the impact of the measurement change occurring at the beginning of 2001. Third, there is the potential effect of SSML on April 1, 2001. For heterosexuals, both depression and anxiety exhibit mild fluctuations across years. The variations in mental health for sexual minorities present a different pattern. Before 2001, there was a substantial gap of sexual orientation for both mental health indicators. From 2001 onward, both indicators for sexual minorities declined drastically and largely converged to those of heterosexuals. The 95% confidence intervals indicate that before 2001, sexual minorities suffered significantly higher depression and anxiety while from 2001 onward the confidence intervals of heterosexuals and sexual minorities overlapped in most years. Assuming that the changes in measurement of depression and anxiety affected heterosexuals and sexual minorities similarly, Figure 3 suggests that SSML has been beneficial to mental health of sexual minorities considerably reducing the corresponding sexual orientation gap.

4 | EMPIRICAL ANALYSIS

4.1 | Exploratory analysis

We consider depression and anxiety as the two main indicators of mental health. Table 1 reports the means of our measures of mental health by sexual orientation as well as by period, that is, pre-SSML and post-SSML. Panel a confirms the preliminary conclusion drawn from Figure 3. On average, sexual minorities had a worse mental health status than heterosexuals. Before SSML, sexual minorities suffered 0.223 (i.e., 0.255–0.032) standard deviation higher depression than heterosexuals. A similar difference is present for anxiety. By comparing the average score in the pre-SSML and post-SSML periods for heterosexuals under the assumption that SSML did not affect their mental health, one obtains a picture

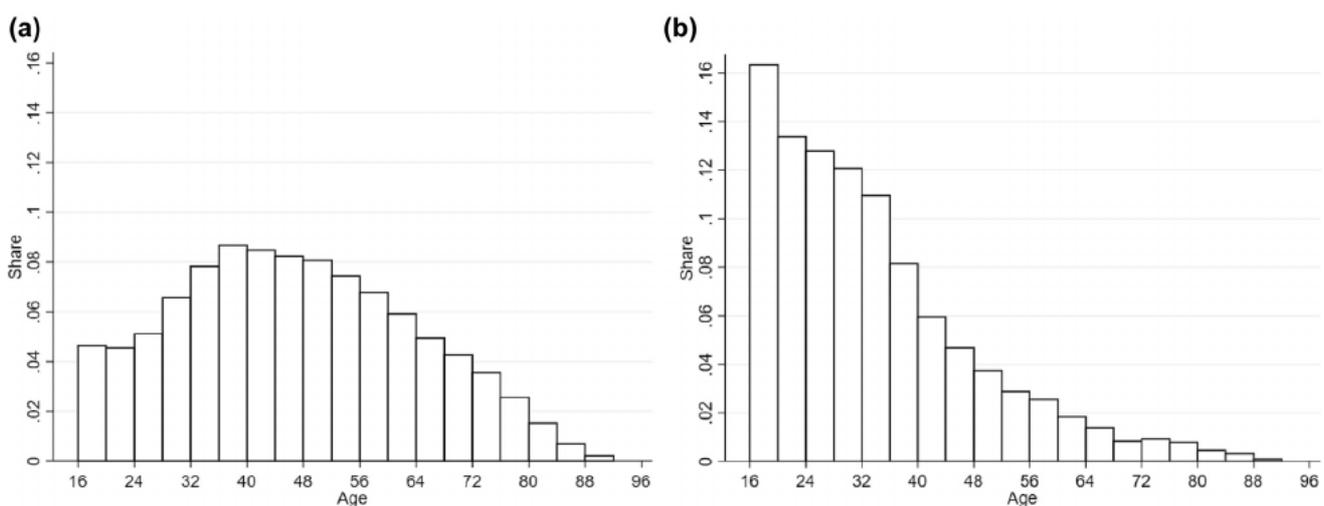


FIGURE 2 Age distribution by sexual orientation. (a) Heterosexuals. (b) Sexual minorities

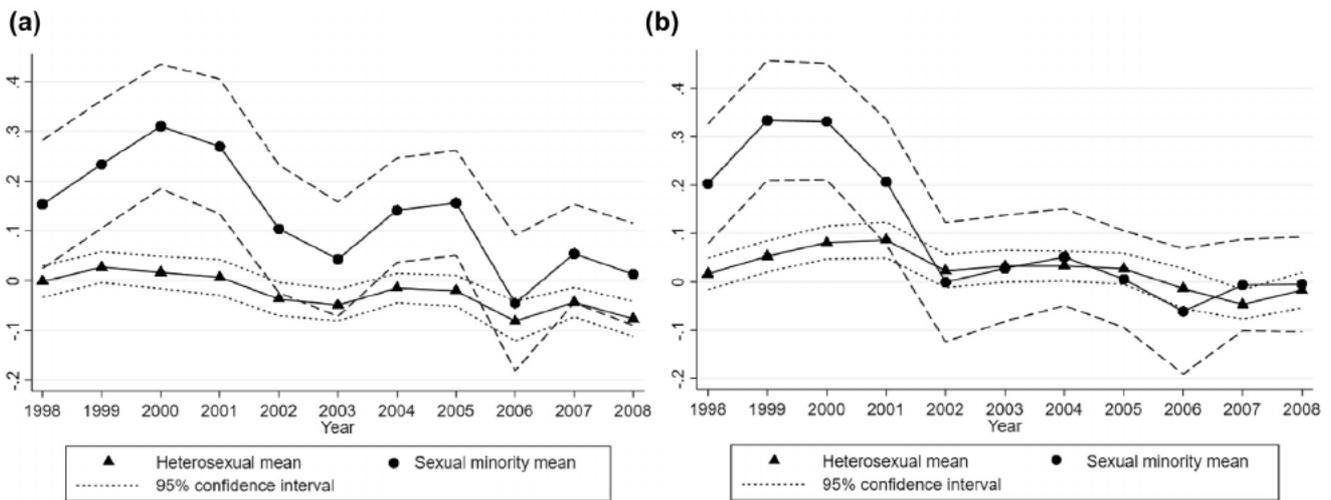


FIGURE 3 Developments of depression and anxiety; annual averages 1998–2008 (standardized scores). Standardized scores with a mean of zero and a standard deviation of one. (a) Depression. (b) Anxiety

TABLE 1 Mental health and marital status by sexual orientation as well as pre- and post-SSML

	Different sex			Same sex			$\Delta\Delta$
	Pre	Post	Δ	Pre	Post	Δ	
Panel a. Mental health							
Depression	0.032	-0.027	-0.059	0.255	0.092	-0.163	-0.104
Anxiety	0.049	0.018	-0.031	0.287	0.019	-0.268	-0.237
Panel b. Marital status							
Divorced	0.042	0.058	0.016	0.070	0.069	-0.001	-0.017
Formal partnership	0.676	0.646	-0.030	0.135	0.186	0.051	0.081
Observations	11,415	25,640	-	912	2770	-	-

Note: Formal partnership includes both registered partnership and marriage.

Abbreviation: SSML, same-sex marriage legalization.

how mental health varied over time because of either calendar time related developments or changes in mental health measurement. If we do the same for sexual minorities, we obtain the sum of the variations over time (including those in measurement) and the effect of SSML. Taking the difference between the changes for sexual minorities and those for heterosexuals yields the unconditional impact of SSML. The first row of panel a shows that for heterosexuals depression dropped by 0.059 standard deviation while for sexual minorities the decrease was 0.163. The DiD suggests that SSML reduced depression for sexual minorities by 0.104 standard deviation. Likewise, the second row of panel a displays that for sexual minorities, anxiety declined by 0.237 standard deviation due to SSML.

4.2 | Estimation strategy

The calculations in Table 1 based on unconditional differences between groups suggest that sexual minorities benefited from SSML in their mental health. However, part of these differences may be attributed to heterogeneity in personal characteristics. Thus we apply a DiD framework controlling for time period fixed effects as well as covariates at the individual level. We implement our main analysis with a pooled sample of men and women in which we include a dummy variable for females. Later we also examine heterogeneous effects of SSML in terms of gender, urbanization, age, labor supply and educational attainment.

The baseline model is specified as follows

$$y_{itm} = \alpha_t + \alpha_m + x_i' \beta_x + \gamma_1 S_i + \gamma_2 L_{im} + \delta S_i \times L_{im} + \epsilon_{itm} \quad (1)$$

in which i denotes individuals, t (1998–2008) stands for calendar years, m (1–12) refers to calendar months and y represents different measures of mental health, that is, depression and anxiety. Furthermore, S indicates a dummy for sexual minorities; L is the period of post-SSML, that is, after April 1, 2001; x denotes a vector of demographic and socioeconomic covariates such as a dummy for female, the quadratic of age, dummies for marital status (married, divorced, widowed) with never married as reference, a dummy for non-Dutch nationality, a dummy for being employed, dummies for completed educational attainment (secondary school, vocational school, applied college, university) with primary school as the omitted category, and dummies for the degree of urbanization of the resident place (a little urban, medium urban, strongly urban, very strongly urban) with not urban as reference. The definitions and descriptives of relevant variables in the baseline model are provided in Appendix A of Supporting Information S1.

The parameter γ_1 measures the difference of mental health between heterosexuals and sexual minorities prior to SSML, γ_2 represents the common effect of the calendar time period after SSML. Our main parameter of interest is δ , which captures the effect of SSML on mental health of sexual minorities. Finally, α_t is a vector of calendar year dummies, α_m is a vector of calendar month dummies and ϵ is an error term. Note that even though measurement changes in mental health occurred in the same year as the SSML, the legislation took place in April while the measurement changes were from January onward already. Thus we are able to disentangle the effect of SSML from the impact of measurement changes by controlling for these calendar year fixed effects besides standardizing and harmonizing the indicators pre-/post-change in measurement separately.

4.3 | Parallel trend assumption

In order to apply the DiD framework, the parallel trend assumption between the treatment and control groups should hold. In the current context this assumption implies that during the post-SSML period, the mental health indicators follow the same trajectory between sexual minorities and heterosexuals in the absence of the legalization. To assess this assumption, we examine whether the pre-SSML time trends in our mental health measures diverge between sexual minorities and heterosexuals.⁹ We replace L in Equation (1) by dummies for all the years separately.¹⁰ In this event study in the DiD framework, if the coefficients of interaction terms of S and year dummies pre-SSML are insignificantly distinguishable from zero, it is evidence for the pre-legalization parallel trends.

Figure 4 illustrates these estimates of the interaction terms for the two mental health variables in which we normalize the coefficient of interaction of S and the period 2000 to 2001 pre-law to be zero for identification. For both depression and anxiety, the estimates of the interactions of S and the pre-legalization year dummies are insignificantly distinguishable from zero. Therefore, arguably, the trends measured pre-SSML between sexual minorities and heterosexuals are parallel for our mental health indicators. Moreover, in Section 5.2 we follow Wolfers (2006) and perform a sensitivity analysis by including sexual orientation-specific time trends “to identify preexisting trends.” By this means we alleviate, if not completely resolve, the potential threat of divergent pre-trends to our identification.

5 | ESTIMATION RESULTS

5.1 | Parameter estimates

Table 2 provides our main parameter estimates. The coefficient of γ_1 indicates that on average before SSML, sexual minorities suffered 0.177 standard deviation higher depression and 0.270 standard deviation higher anxiety than heterosexuals. Both differences are significant. For heterosexual individuals, the legislation of SSM did not have a significant effect on the mental health variables (parameter γ_2). This result verifies the assumption of our DiD approach: the natural experiment did not affect the control group. The parameter estimate δ is significantly negative for both depression and anxiety. Both mental health indicators of sexual minorities largely though not completely converged to their counterpart of heterosexuals. The legalization reduced the sexual orientation gaps of depression and anxiety by 50% (0.089/0.177) and 87%, respectively. The last row of the table presents p -values indicating whether or not the sum of the coefficients γ_1 and δ equals zero. If so, it implies that SSML closed the sexual orientation gap of mental health. Despite the remarkable convergence, the sexual orientation gap was not yet completely eliminated even though such a gap of anxiety post-SSML was significant only at the 10% level.

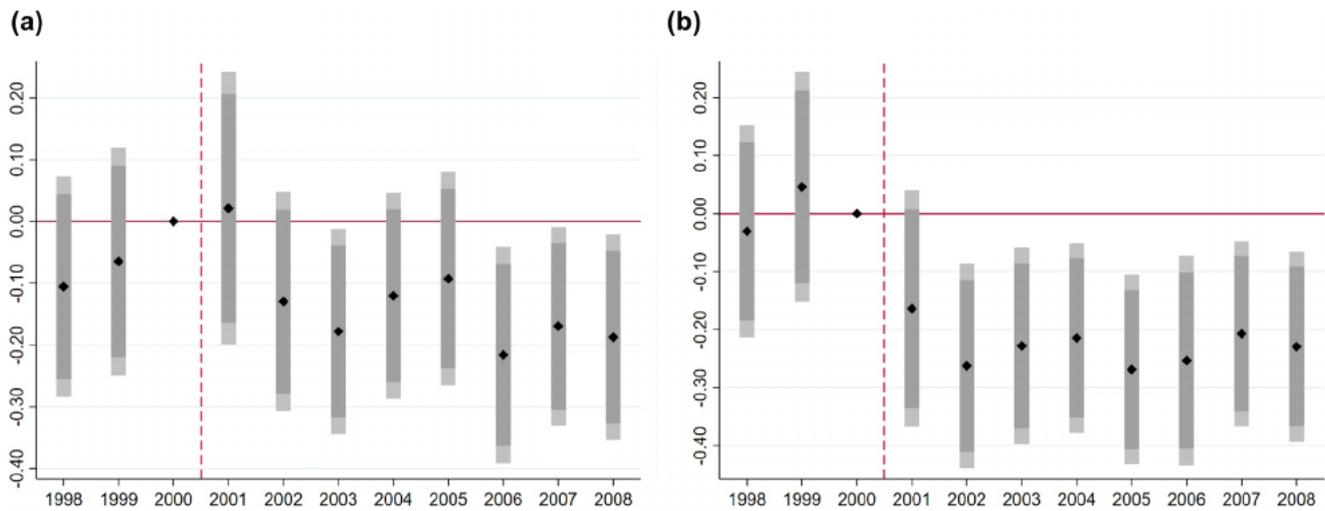


FIGURE 4 Event study in difference-in-differences (DiD) framework—coefficients of interactions of same-sex and year dummies. The coefficient of same sex \times the period 2000–2001 pre-law is normalized to be zero for identification. The segments denote 90% (dark) and 95% (light) confidence intervals of estimated coefficients, respectively. (a) Depression. (b) Anxiety

TABLE 2 Baseline parameter estimates effects of SSML on mental health

	Depression	Anxiety
Same sex (γ_1)	0.177 (0.039)***	0.270 (0.041)***
SSML (γ_2)	−0.006 (0.044)	0.068 (0.044)
Same sex \times SSML (δ)	−0.089 (0.044)**	−0.235 (0.045)***
p value ($\gamma_1 + \delta = 0$)	0.0001***	0.094*

Note: Based on 40,586 observations. Only the relevant parameter estimates are presented. Appendix B in Supporting Information S1 displays all parameter estimates.

Abbreviation: SSML, same-sex marriage legalization.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors in parentheses.

Estimates of covariates are reported in Appendix B of Supporting Information S1. Females suffered 0.165 standard deviation higher depression and 0.312 standard deviation higher anxiety. Age exerts statistically significant influence on both mental health indicators too. Based on the quadratic specification of age effects, the mental health conditions present an inverted “U” shape along age with the vertex at 45 year-old for depression and 51 for anxiety. Compared to never married individuals, on average marrieds had more satisfactory mental health status in both indicators. The divorced and widowed suffered more serious mental health issues. Non-Dutch citizens in the Netherlands had worse mental health conditions than Dutch citizens but the difference was not significant for anxiety. Employees enjoyed better mental health than non-employees. Moreover, individuals with a higher educational attainment had a better mental health status for depression but not for anxiety; people residing in a place with a higher urban degree suffered more serious mental health problems. Furthermore, the calendar year fixed effects account for both the evolution of mental health indicators across time and the changes in measurement common for all people. Indeed for our mental health measures, the coefficients of most post-2000 years are in an opposite direction to the phase before 2001 suggesting that the calendar year effects are mainly driven by the measurement changes of mental health that occurred in 2001. Finally, the constant represents the expected mental health conditions of the general reference group, that is, never married heterosexual Dutch men who are non-employed without a high school degree, live in the countryside and answered the health survey in January, 1998. Among this group of people, they had an anxiety score of -0.625 and an insignificant depression score of -0.039 .

5.2 | Additional analyses

To investigate the robustness of our main findings, we perform a wide range of additional analyses which are presented and discussed in detail in Appendix C of Supporting Information S1. First, we examine heterogeneity of the mental health effects of SSML in terms of gender, urban characteristics of the resident place, age cohort, employment status

and educational attainment. We conclude that SSML closed the sexual orientation gap of mental health more completely among women, residents in low urban regions, younger people and college degree holders. Then, we do more robustness checks by including sexual orientation-specific time trends and allowing for flexible response dynamics to SSML, and using a comprehensive sample including individuals with unknown sexual orientation. We also explore the potential endogenous assignment of some sexual minorities to the treatment group as well as the potential issue of bad controls. Moreover, we implement the propensity score matching method to make individuals in the treatment and control groups more comparable. Furthermore, we exclude the possibility of confounding events responsible for the improved mental health of sexual minorities. All these results confirm the mental health gains of sexual minorities owing to SSML. Additionally, we analyze the effects of SSML on some other mental health related variables, such as feeling empty, the use of sleeping pills and heavy drinking—the measures not changing in 2001. With these unchanged variables as alternative mental health measures, we also document beneficial effects of SSML. These results suggest that the measurement changes in depression and anxiety may not make a difference in determining the mental health effects of SSML. Finally, we study whether the introduction of a registered partnership had an effect on mental health of sexual minorities finding that this is not the case.

5.3 | Potential mechanisms

In this subsection, we explore the mechanisms through which SSML may have affected mental health. After the legislation, sexual minority individuals are allowed to be married to a same-sex spouse and thus enjoy the well-being and health gains from marriage. The legalization may also stabilize the partnership market reducing separation rates (Chen & van Ours, 2020), which facilitates the improvement in mental health (Kohn & Averett, 2014; Stroschein et al., 2005). Moreover, even for sexual minorities who did not take the option of marriage soon after SSML, the enlarged choice set of partnership forms may benefit their mental health as well as encourage their formal partnership formation in the future. After all, more options do not hurt. In addition, improved tolerance toward sexual minorities (Aksoy et al., 2020; Corneo & Jeanne, 2009) or self-perception of being societally accepted (Badgett, 2011) owing to SSML may help to shrink the sexual orientation gap in mental health. We analyze and discuss these channels below.

First, to examine the potential mechanism of marriage, we compare the mental health effects of SSML for married sexual minorities to those for non-married sexual minorities, with general heterosexuals regardless of their marital status as the reference.¹¹ Specifically, we replace in Equation (1) $S \times L$ by $S \times L \times M$ and $S \times L \times (1 - M)$ together, where M represents marriage exclusive of registered partnership. Hence the coefficient of $S \times L \times M$ captures the effect of entering an official SSM permitted after SSML only whereas $S \times L \times (1 - M)$ identifies the impact of the legalization for non-married sexual minorities. The relevant parameter estimates are displayed in Table 3.

The coefficients δ_1 indicate that officially married sexual minorities obtained substantially larger improvements in depression than their non-married counterpart after the legislation. This difference is in the opposite direction for anxiety. In the lower panel of the table we test three hypotheses: (1) whether SSML affected married and non-married sexual minorities differently; (2) whether mental health of married sexual minorities completed the convergence to heterosexuals; and (3) whether mental health of non-married sexual minorities completed the convergence to heterosexuals. The p -values for the first test suggest marginally significant divergences between married and non-married sexual minorities for depression but insignificant differentials for anxiety. Results of the second and third tests tell that SSML closed the sexual orientation gap in depression for married sexual minorities but did not completely close the gap in anxiety or for

	Depression	Anxiety
Same sex (γ_1)	0.227 (0.038)***	0.304 (0.040)***
Same sex \times SSML \times Married (δ_1)	-0.181 (0.061)***	-0.187 (0.063)***
Same sex \times SSML \times Non-married (δ_2)	-0.088 (0.045)*	-0.257 (0.045)***
p value ($\delta_1 = \delta_2$)	0.073*	0.178
p value ($\gamma_1 + \delta_1 = 0$)	0.330	0.016**
p value ($\gamma_1 + \delta_2 = 0$)	0.000***	0.036**

Note: Based on 40,586 observations; see also footnotes in Table 2.

Abbreviation: SSML, same-sex marriage legalization.

TABLE 3 Parameter estimates potential mechanism of marriage

non-married sexual minorities. Thus marriage itself seemed to play a beneficial role in reducing depression among sexual minorities following SSML.

There are several issues related to the estimates in Table 3. First, we are not trying to identify the causal effect of marriage protection on mental health. With our cross-sectional data we are unable to account for potential selection into marriage or reverse causality (see Chen & van Ours, 2018, for a detailed discussion on these problems). Here we simply explore the role of marriage by comparing the differential effects of SSML between married and non-married sexual minorities. The significant mental health improvement among non-married sexual minorities after SSML should be interpreted beyond marriage itself.

Second, if SSML did not improve both mental health indicators of sexual minorities through marriage only, the legalization could exert its influence by stabilizing same-sex relationships and diminishing their separation rates. A large literature has documented a negative association between (mental) health and separations, for example, Strohschein et al. (2005) and Kohn and Averett (2014). In panel b of Table 1, we present proportions of individuals divorced from a formal partnership by sexual orientation and pre-/post-SSML. The increase in the separation percentage for heterosexuals (1.6 percentage points) represents the general evolution of divorce over time while the DiD in the separation percentage in the last column means the unconditional decline in divorce of same-sex formal partnerships owing to SSML.¹² Moreover, applying a bivariate timing-of-events model to the Dutch administrative data on durations of same-sex formal partnerships, Chen and van Ours (2020) show that SSML indeed stabilized partnerships. Hence marital stability may be a mechanism to explain the beneficial mental health effects of SSML.

Third, in Table 3 we see that sexual minorities who were not married also obtained mental health gains after SSML. Another possible explanation for such gains is that they enjoyed having a richer choice basket of partnership forms so that they were able to enter either partnership form they preferred in the future. If this is true, we should observe an increase in same-sex partnership formations post-legalization. Panel b of Table 1 also displays the proportions of individuals in a formal partnership by sexual orientation and pre-/post-SSML. The percentage of formally partnered sexual minorities rose after the legislation by 5.1 percentage points, and with heterosexuals as the benchmark by 8.1 percentage points. Furthermore, this channel of an enlarged choice set again goes along with Carpenter et al. (2021) and Chen and van Ours (2020) who find that the legalization induced not only never married sexual minorities crowding into marriage (both studies) but also same-sex registered partnerships transforming into marriage (the latter study). Thus the richer choice basket of partnership forms may contribute to the mental health gains especially for those non-married sexual minorities.

Finally, indirect channels, such as improved tolerance toward sexual minorities or self-perception of being socially accepted may also play an important role in alleviating sexual minorities' mental health issues. Aksoy et al. (2020) adopt annual attitudes toward sexual minorities from the European Social Survey and find that these attitudes improved following the laws recognizing same-sex relationships.¹³ Badgett (2011) concludes on the basis of an analysis of qualitative data from the Netherlands and Massachusetts that the right to marry and exercising the right to marry are associated with greater feelings of social inclusion among same-sex couples. This evidence implies that SSML has worked well as an anti-discrimination policy with beneficial spillover effects to mental health of sexual minorities.

6 | DISCUSSION AND CONCLUSIONS

For a long time, sexual minorities have been discriminated in different situations including the right of marriage. Such institutional discrimination and unfair treatment have harmed their mental health. Over the past decades, in more and more countries social attitudes toward sexual minorities improved and marriage was made available to same-sex couples. This reform of marital policy may have exerted beneficial mental health effects for sexual minorities.

The Netherlands is highly tolerant for sexual minorities. Table 4 provides an overview of attitudes to homosexuality in European countries. Clearly, attitudes have become more favorable in all countries presented. The percentage of the population that thought "homosexuality is never justified" dropped, for example, in Spain from a high 57 in 1981 to 17 in 2008. In Belgium, France, and Norway, the other countries scoring at least 50% in 1981 on the "homosexuality never justified" question, the proportions were all below 20% in 2008. In the Netherlands where already in 1981 only 25% thought that homosexuality was never justified—in the current century this value was below 10%. The right-hand side of Table 4 displays a similar trend of attitudes to sexual minorities in the first decade of this century based on the statement "gay men and lesbians should be free to live their life as they wish". In 2002, the share of the population agreed with this

	Homosexuality never justified				Gays and lesbians live their life	
	1981	1990	1999	2008	2002	2010
Belgium	52	41	27	16	80	87
Denmark	38	36	21	12	89	90
France	52	40	23	19	79	83
Germany	45	36	19	17	75	83
Great Britain	47	40	25	23	76	85
Netherlands	25	13	7	8	88	93
Norway	50	45	-	12	76	84
Spain	57	47	22	17	72	82
Sweden	39	37	9	12	82	90

Note: The numbers are from the European Value Survey 1981, 1990, 1999, and 2008 (percentage of inhabitants thinking that homosexuality is never justified) and the European Social Survey 2002, 2010 (percentage of population who believe that gay men and lesbians should be free to live their life as they wish).

Source: Kuyper et al. (2013).

TABLE 4 Attitudes to homosexuality in European countries

statement was 80% or more in Belgium, Denmark, the Netherlands and Sweden. In 2010, at least 90% of the population held such an opinion in Denmark, the Netherlands and Sweden.

We study how the 2001 SSML in the Netherlands affected mental health of sexual minorities focusing on depression and anxiety. The societal attitudes toward homosexuality in the Netherlands are highly tolerant. In such an open-minded society one would expect the effects of SSML on mental health of sexual minorities to be limited. Nevertheless, we do find a significant improvement in mental health of sexual minorities following the legislation. We also find that marriage itself was only partially responsible for the amelioration of mental health among sexual minorities. In the post-legislation period married sexual minorities obtained significantly larger mental health gains than non-married ones for depression but not for anxiety. More importantly, the legal recognition of same-sex marriage improved mental health for both male and female sexual minorities irrespective of their own marital status. As suggested by Corneo and Jeanne (2009), SSML is an anti-discrimination policy that may increase the societal tolerance for homosexuality. Thus part of the beneficial mental health effects documented in the current study may be due to the actual or perceived improvement of the societal tolerance for sexual minorities.

The high tolerance and open mind for sexual minorities in the Netherlands may generate a concern on the external validity of our study. In less tolerant or more conservative countries and areas, the effects of SSML could be different. Nonetheless, in that case there is more room for the improvement of societal attitudes to sexual minorities. Therefore, the mental health effects of SSML in the Netherlands are likely to be a lower bound for less tolerant or more conservative societies.

SSML substantially decreased the sexual orientation gap of mental health. As a typical anti-discrimination policy, SSML is effective in improving not only societal attitudes to discriminated individuals (sexual minorities in the current context) but also their health and well-being. The findings of this study may suggest that anti-discrimination policies can have beneficial mental health effects for discriminated minorities in general with respect to race, religion, immigration, disability and so forth.

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CONFLICT OF INTEREST

None.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from Statistics Netherlands. Restrictions apply to the availability of these data which are only available for analysis through a remote access facility.

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ENDNOTES

- ¹ Stevenson and Wolfers (2007) provide an overview of developments of family institutions over the past decades; Ciscato et al. (2020) discuss assortative mating of same-sex couples; Baranov et al. (2020) argue that preferences for partnership formations including same-sex marriage are very persistent over time. Dee (2008) provides an early overview of same-sex partnership laws in Europe.
- ² Tolerance can have important health effects. For example, on the basis of an analysis of state-level panel data Francis and Mialon (2010) conclude that tolerance for sexual minorities reduced the HIV rate. The authors identify the entry of low-risk men into same-sex partnership markets and the diminution in underground and risky behaviors of sexually active men as mechanisms.
- ³ In 2001, such fast divorces accounted for merely 0.2% in all divorces in the Netherlands. Moreover, this procedure had been accessible to both different-sex and same-sex marrieds. Thus we are not particularly concerned that this fast divorce implementation would seriously threaten our identification of the mental health effects of same-sex marriage legalization (SSML).
- ⁴ Here marriage refers to the formal relationship including both RP and marriage.
- ⁵ Given that the legislation of SSM might encourage sexual minorities to enter their first ever same-sex relationship, the assignment to treatment could be correlated with the treatment itself. That is to say, the identification of same-sex relationships could be correlated with the legalization. To alleviate this concern, in a sensitivity analysis in Section 5.2 we exclude from the treatment group people who started their first same-sex relationship after SSML. Our main conclusions in this analysis are not different from the baseline analysis.
- ⁶ In a separate analysis presented in Appendix C4 of Supporting Information S1, we investigate the mental health effects of the introduction of RP.
- ⁷ Later on, in a sensitivity analysis with an extended sample of individuals aged 16–90, we show that our main conclusions are not dependent on the age range.
- ⁸ In our baseline sample, the proportion of sexual minorities is 9%. This is because this sample is relatively young compared to for example Buser et al. (2018) and Chen and van Ours (2018). Furthermore, we exclude individuals who had never been partnered from our sample while other studies include them as heterosexuals.
- ⁹ The limitation of this difference-in-differences (DiD) estimation strategy is that the counterfactual group consisting of sexual minorities that were not exposed to SSML in the same period of time is unavailable, and that we are able to test only the pre-legalization parallel trends between the treatment and control groups.
- ¹⁰ It is called the “Auto” model following Autor (2003) or the leads and lags model by Atanasov and Black (2016).
- ¹¹ We do not estimate two models separately—comparing married sexual minorities to married heterosexuals, and comparing non-married sexual minorities to non-married heterosexuals, respectively—because this procedure will further reduce the number of observations for sexual minorities in each of the models and result in imprecise estimation. Moreover, it is more straightforward and convenient to compare and test the effects of SSML for married versus non-married sexual minorities in one model rather than in two separate models.
- ¹² The unconditional percentage of separations within sexual minorities did not diminish substantially post-SSML in absolute terms. Nevertheless, we are trying to explain the channel for the mental health effects of SSML identified with DiD and hence in relative terms (comparing sexual minorities to heterosexuals). Therefore, we need to focus on the relative reduction in the separation percentage accounting for the calendar time related developments rather than the absolute separation change within sexual minorities.
- ¹³ Unfortunately the European Social Survey began in 2002 thus we could not obtain a pre-SSML wave for the Netherlands to compare. Though we cannot directly relate it to SSML, the Eurobarometer indeed presents improved attitudes of Dutch respondents toward sexual minorities after the legislation. In the wave of 1997 pre-SSML, the proportions of being in favor of the right of sexual minorities to get married and to adopt children were 85.3% and 70.3%, respectively. In 2001 post-SSML, these percentages increased to 90.0% and 74.3%, respectively.

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SUPPORTING INFORMATION

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