Pink Brick Road: The Impact of Same-Sex Marriage Legalization in the US on the Inflow of Skilled Labor

Koroles Awad [*]

Jill J. McCluskey

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Abstract

This paper examines how the legalization of same-sex marriage affects the migration of skilled labor from Europe to the United States. Using visa admission data from the Department of Homeland Security, we address two main questions: (1) the influence of European marriage equality laws on skilled labor migration to the U.S., and (2) the impact of U.S. marriage equality policies on these migration flows. Applying a difference-in-differences approach, we observe a 0.077 decrease in skilled worker admissions per 1,000 labor force members in European countries following marriage equality enactment, translating to an annual reduction of approximately 600 skilled workers. This impact strengthens within five years of policy implementation. Moreover, results from a two-way fixed-effects model suggest that U.S. federal recognition of same-sex marriage helps to counterbalance this decline. These findings highlight that marriage equality policies in Europe and the U.S. have a notable impact on skilled labor migration patterns.

[*]Washington State University, koroles.awad@gmail.com

Introduction

Skilled labor migration is crucial for bolstering the U.S. economy, particularly in Science, technology, engineering, and mathematics, which increases total factor productivity growth in US (Peri, Shih, & Sparber, 2015). While higher potential lifetime earnings are a well-known driver for international migration (Massey et al., 1993; Westerlund, 1997), non-monetary factors such as familial and cultural ties also significantly influence individuals' decisions to relocate (Borjas & Bronars, 1991; LaLonde & Topel, 1997).The introduction of same-sex marriage expands the familial ties. For LGBTQ+ individuals, access to legal same-sex marriage offers substantial social and legal benefits, including tax advantages, adoption rights, and surrogacy opportunities. These benefits can profoundly impact their migration choices.

Despite the understanding that marriage equality can affect domestic migration within the U.S.(Marcén & Morales, 2022; Beaudin, 2017), less is known about how international marriage equality policies influence transnational skilled labor migration. As European countries progressively legalize same-sex marriage, a critical question arises: Do these policy changes affect the inflow of European skilled labor to the U.S.?

This paper investigates how access to legal same-sex marriage influences international skilled labor migration. Specifically, we address two key research questions: First, how do marriage equality policies in European countries impact the inflow of European skilled labor to the United States? Second, how do U.S. same-sex marriage policies affect skilled labor migration from European countries that have enacted marriage equality?

To explore these questions, we utilize data from the Department of Homeland Security on H1B visa admissions spanning from 2000 to 2019. This period captures the variation in the timing of marriage equality enactments across 13 European Union countries. For our first question, we employ a difference-in-differences methodology developed by Callaway and Sant'Anna (2021) to estimate the dynamic effects of European marriage equality laws on skilled labor admissions to the U.S. For the second question, we apply a two-way fixed-effect model based on Wolfers (2006) to analyze the impact of U.S. same-sex marriage policies on the inflow of skilled labor from these

European countries.

Our analysis reveals that the enactment of marriage equality in European countries leads to a significant decrease in skilled worker admissions to the United States. Specifically, we find a decrease of 0.077 skilled worker admissions per 1,000 individuals in the labor force from EU countries that enacted marriage equality, equating to an average of 600 fewer skilled workers admitted annually from each country ($p < 0.01$). These effects intensify up to five years after the policy change, indicating a lasting impact on migration patterns.

Furthermore, our second analysis shows that U.S. federal recognition of same-sex marriage mitigates this decline in European skilled labor admissions. The federal recognition appears to counterbalance the reduced incentive for skilled LGBTQ+ individuals to migrate to the U.S. following marriage equality enactments in their home countries. This suggests that inclusive policies in the U.S. can help retain and attract skilled foreign workers despite progressive changes abroad.

Our study contributes to the existing literature by extending the focus from domestic to international migration concerning marriage equality policies. Previous research has predominantly concentrated on interstate migration within the U.S. Beaudin (2017) found that same-sex households and heterosexual households headed by women were more likely to migrate to states with marriage equality. Marcén and Morales (2022) demonstrated that same-sex marriage legalization led to an increase in gay men relocating to states with such policies. By examining international skilled labor migration, our research provides new insights into how marriage equality influences global talent movements.

In addition to our main findings, we conduct robustness checks to ensure the validity of our results, including accounting for potential anticipation effects, placebo test using visitor visa admissions. Our results remain consistent across these specifications, reinforcing the robustness of our conclusions.

These findings suggest that marriage equality and its recognition can be strategic tools for countries aiming to attract and retain skilled labor. For the U.S., recognizing same-sex marriages may help offset the decline in skilled labor admissions from countries where marriage equality has been enacted. For European countries, enacting marriage equality may help retain skilled LGBTQ+

3

workers who might otherwise migrate to countries offering greater legal and social benefits. However, our analysis faces limitations due to data constraints. We lack information on the sexual orientation of foreign skilled workers, so we infer the impact on LGBTQ+ individuals based on aggregate migration patterns. Future research with more granular data could provide deeper insights and validate these findings further.

Data

To look at policy impacts on the US labor force from 2000 to 2019, we utilize the variation in EU country marriage equality enactments. The modern history of the legalization of same-sex marriages began in the Netherlands in 2000 when the country's House of Representatives passed legislation to legalize same-sex marriage, which subsequently took effect in 2001 (Mendos, 2020). Marriage equality enactments in the EU predominantly occurred through the passage of new legislative acts. However, marriage equality in Austria was established through a Constitutional Court ruling and in Ireland via a referendum (Masci, Sciupac, & Lipka, 2020). In the data, the date same-sex marriage was legally effective is the date we consider marriage equality enacted for that country. For example, the date of same-sex marriage legalization is 2001, while the legislation passed in 2000 for the Netherlands; so we consider 2001 as the year marriage equality was enacted. We leverage the exogenous variation resulting from the various legal mechanisms leading to same-sex marriage and the differences in the time they became effective to measure the effect of increased access to marriage.

Table 1, shows the year of same-sex marriage legalization passed and the years they took effect. For some countries, legislation came into effect in the years following the policy change being approved by the government. We use the year of the policy taking effect as the treatment start time in our analysis, not the time the policy was approved by the governing systems. The time difference can pose a violation of one of our identifying assumptions, which is the limited anticipation assumption. We discuss the validity of this assumption in the next section.

To identify the effect of marriage equality on the inflow of skilled transnational labor, we utilize

4

Table 1: EU Countries Marriage Equality History

Country	Year Policy Took Effect	Year of the Policy Change
Netherlands	2001	2000
Belgium	2003	2002
Spain	2005	2005
Sweden	2009	2009
Portugal	2010	2009
Denmark	2012	2012
France	2013	2013
Ireland	2015	2015
Luxembourg	2015	2014
Finland	2017	2014
Germany	2017	2017
Malta	2017	2017
Austria	2019	2017

yearly visa admission data from the Department of Homeland Security from 2000 to 2019. This dataset comprises information on the total annual admissions at ports of entry, including data on citizenship and visa type. Given our specific focus on the inflow of European skilled labor, we restrict our analysis to admissions of EU citizens holding H1B visas.

The H1B visa program, administered by the federal government, is designed to admit temporary foreign workers into the US for positions in specialty occupations. To qualify for these visas, individuals must possess a (1) bachelor's degree and (2) highly specialized knowledge. The U.S. government imposes an annual cap on the number of H1B visas issued, and visas are allocated through a randomized lottery system. Within this system, a smaller subgroup of qualified applicants is randomly selected to receive H1B visas. Individuals with graduate degrees have a higher chance of receiving H1B visas because they are entered into a separate lottery reserved for Masters and PhD holders. Certain institutions, such as universities and nonprofits, are exempt from the lottery system (Kulkarni et al., 2019).

Admission data (US-Department-of-HomelandSecurity, n.d.) only lists individuals who have already been granted H1B visas. We consider an admission to have occurred when individuals enter the US through a port of entry. To account for variations in population sizes across different countries, we use population data from the (WorldBank, n.d.) to calculate the number of admissions

per 1,000 individuals in the respective countries' labor force in the EU. This normalization helps reduce the impact of population size differences when comparing admission rates across countries. Figure 1 shows the number of admissions per 1,000 labor force of the 13 countries that have legalized same-sex marriage in the data time frame. Figure 2 shows the values in fig:enter-label1 normalized to the year marriage equality was enacted.
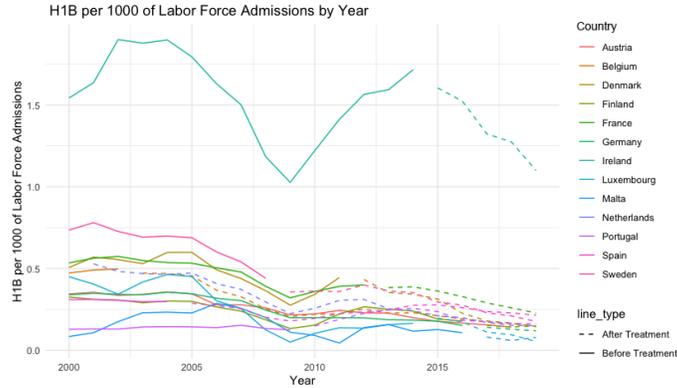

Figure 1: Annual admissions per labor force capita from EU countries with Marriage equality
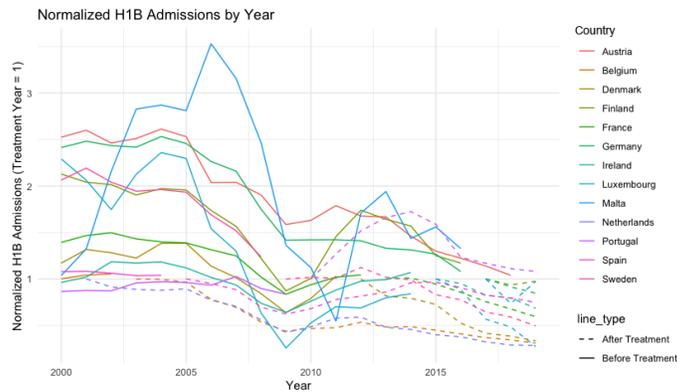

Figure 2: Annual admissions per labor force capita Normalized to the legalization year

US same-sex couples are more likely to hold a master's degree or higher, and male same-sex couples are more likely to move to a state different from their birthplace (Badgett, Carpenter, & Sansone, 2021). According to the Homeland Security 2020 H1B report, the skilled labor visa (H1B) holders population is comprised of 73.7% males and 54.2% master's degree holders (U.S.

Department of HomelandSecurity, 2023). Therefore, we focus on the US skilled labor population because this population is likely to be impacted by a country's marriage equality policies. We use the same data to answer the paper's two questions.

We do not have data on the sexuality of foreign skilled labor in the US, but given that same-sex couples are more likely to have master's degrees and the males in a same-sex relationship to migrate, we expect the effects of marriage equality to be more pronounced among the foreign skilled labor H1B visa holders.

Methodology

To answer our first question, We follow Callaway and Sant'Anna's methodology (2021) and calculate the average treatment effects. This question focuses on policy changes in EU home countries; however, we acknowledge that changes in US policy play a role in US migration by skilled European workers. Using this estimator allows us to estimate the overall effects and study the possible dynamics and heterogeneity within the effects. Countries are grouped based on treatment time, with each group containing all countries legalizing same-sex marriage in a given year. We have a total of 10 groups. The treatment effects are calculated for each group and year based on Sant'Anna and Zhao's doubly robust estimator (2020):

$$ATT_{g,t} = \mathbb{E}[Y_t - Y_{g-1} \mid G_g = 1] - \mathbb{E}[Y_t - Y_{g-1} \mid C = 1] \quad (1)$$

$ATT_{g,t}$ is the average treatment effect for the group starting treatment at time g at year t. G_g is a binary variable that is equal to 1 if a unit is first treated in period g, and C is a binary variable that is equal to 1 for units that are never treated. Y is H1B visa admission per 1,000 of the labor force. The values of $ATT_{g,t}$ are aggregated to get $\theta_{es}(e)$, the average treatment effect by length of exposure. The length of exposure (e), is defined as $e = t - g$. $\theta_c(t)$ is aggregated values by treatment group, i.e. the group of countries legalizing same-sex marriage in the same year g. $\theta_{es}(e)$ and $\theta_c(t)$ are calculated by the following equations:

$$\theta_{es}(e) = \sum_{g \in G} 1\{g + e \leq T\} \cdot \mathrm{ATT}(g, g + e) \quad (2)$$

$$\theta_c(t) = \sum_{g \in G} \cdot \text{ATT}(g, t) \qquad (3)$$

To estimate the overall average effects by time and by group the averages a

$$\theta_{\text{es}}{}^O = \frac{1}{T-1} \sum_{e=0}^{T-2} \theta_{\text{es}}(e), \quad \theta_{\text{c}}{}^O = \frac{1}{T-1} \sum_{t=2}^{T} \theta_c(t) \qquad (4)$$

To answer the second question, we look at the effects of US policy on US migration by European skilled workers. One significant US federal policy change that directly affects migrant same-sex spouses is the Supreme Court's 2013 ruling in *U.S. v. Windsor*, which led to the federal recognition of same-sex marriages. Another major policy change is the 2015 Supreme Court's ruling in *Obergefell v. Hodges*, which led to the federal legalization of same-sex marriages. To explore the potential effects of these policy changes, we employ a two-way fixed-effect model based on Wolfers' methodology (Wolfers, 2006). This methodology was used by Marcén & Morales (Marcén & Morales, 2022) when estimating the effect of same-sex marriage on interstate migration. We estimate the two-way fixed model for US migration from the EU as follows:

$$Y_{s,t} = \sum_j \beta_{j1} \, Legalization_{s,t,j} + \sum_j \beta_{j2} \, Legalization2013_{s,t,j} + \sum_t \theta_t + \sum_s \eta_s +$$
$$\sum_s Country_s * Year_t + [\sum_s Country_s * Year_t^2 + controls_{s,t}] + \epsilon_{s,t} \qquad (5)$$

Where $Y_{s,t}$ is H1B visa admission per 1,000 of the labor force from an EU country s, in year t. The time after legalization is split into four time periods, three two-year periods, and a period for year seven and more after the policy change. The different time periods are denoted by different j values. $Legalization_{s,t,j}$ is a binary variable that equals 1 in the years same-sex marriage was legal in country s and being in period j of treatment. $Legalization2013_{s,t,j}$ is the binary variable that is equal to $Legalization_{s,t,j}$ after 2013, and 0 otherwise. $Country_s * year_t$ are country-specific linear trends. θ_t and η_s are year and country fixed effects. β_{j1} values are the effects of marriage equality until 2013 in period j of the policy change. β_{j2} values are the change in effects after 2013.

Our analysis' identifying assumptions are (1) limited treatment anticipation and (2) pre-treatment parallel trends. Anticipation behavior would present in treatment effects before the treatment time. Annual data limits anticipation behavior and we do test this assumption by studying the treatment

effects in countries that introduced marriage equality legislation years before their implementation. The pre-treatment parallel trends assumption is based on the control group, which is the never-treated group in our main analysis and the not-yet-treated groups in one of our robustness checks. The never-treated group includes countries that have not legalized same-sex marriage. The not-yet-treated groups are the countries that legalized same-sex marriage but before enactment.

Results

For our first question, we calculate the $ATT_{g,t}$ for each group of countries that legalized same-sex marriage in the same year. The values are averaged by time and treatment group. The overall average effect aggregated by time t is -0.16 admissions per 1,000 of the labor force (p<0.01). The time-specific average effects are shown in Figure 1. Aggregating effects on treatment groups result in an overall average treatment effect of -0.077 (p<0.01). Compared to average yearly admissions into the US from EU countries, this is a 22% decrease in admission due to marriage equality policies. It equates to about 600 fewer admissions into the US each year.
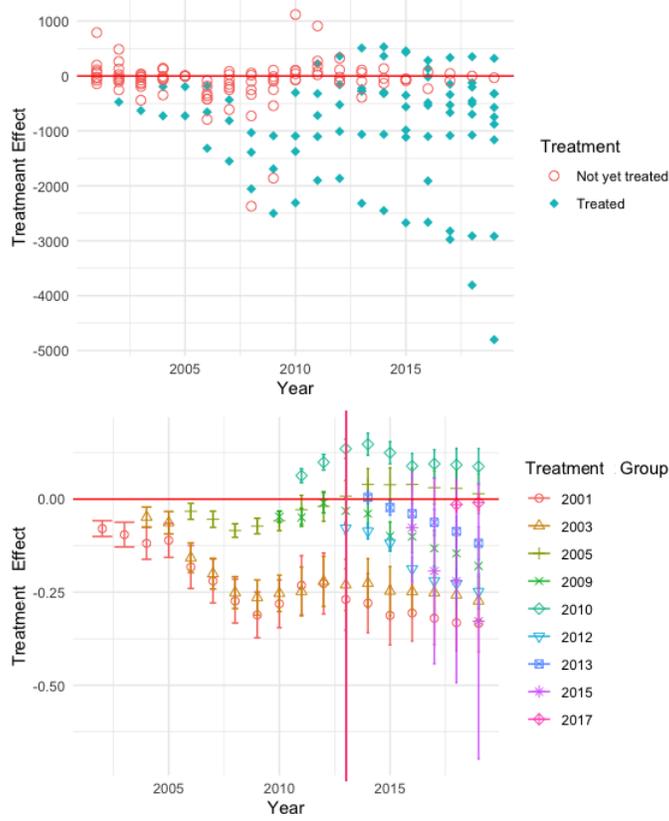
Figure 3: $ATT_{g,t}$ for the treated countries before and after treatment

Figures 3 and 4 show the dynamic nature of the treatment effect and the heterogeneity of the treatment effects from one treatment group to another. The negative treatment effects increase in magnitude in the first 5 years. The heterogeneity of treatment effects is most noticeable in the 2010 treatment group, which only includes Portugal. The estimated effects positively impact 0.095 (p<0.01). There also seems to be an upward trend in the treatment effect on the year of treatment. However, it's important to note that the average treatment effects for the last two groups, 2017 and 2019, are small due to the limited treatment time.

We find a difference in the overall aggregated treatment effect based on aggregation method, by time or group. This difference is due to how the overall effects are calculated. Aggregating by time and dynamic effects leads to the results being more driven by the earlier treated countries,

which have more negative effects. Aggregating by group places a higher weight on the later treated groups, compared to the dynamic aggregation, leading to lower average effects. However, both estimates are statistically significant with overlapping confidence intervals.
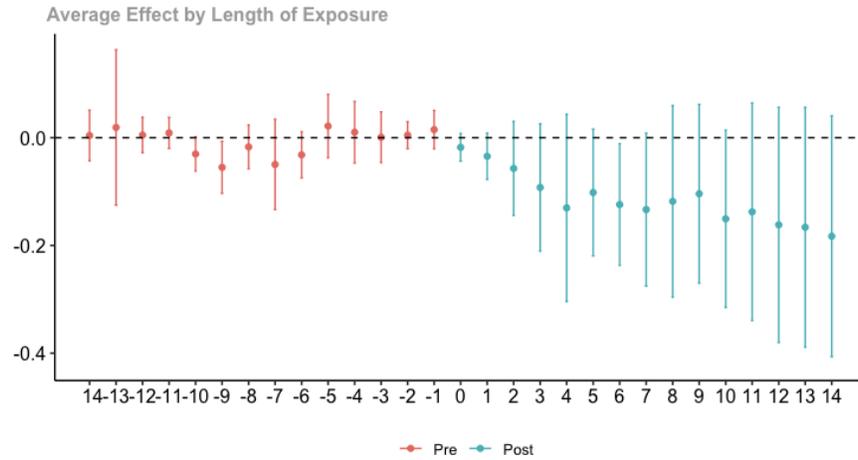

Figure 4: Effects of Marriage Equality on the US Inflow of European Skilled Labor by Time. Year 0 is the year same-sex marriage became legal.
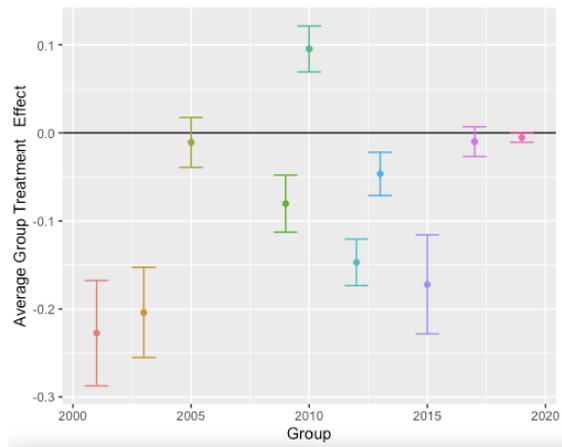

Figure 5: Effects of Marriage Equality on the US inflow of European Skilled Labor by Group. Year groups include EU countries that legalized same-sex marriage in that year.

To test the Parallel trends assumption we use the following event study analysis to test our parallel trends assumption:

11

$$Y_{s,t} = \theta_t + \eta_s + \sum_{l=-6}^{6} D_{st}^l \mu_l + \epsilon_{s,t} \qquad (6)$$

Where D_{st}^l is a binary variable that is 1 in year l from the year of marriage equality in country s. μ_l is the effect in period l. We drop all observations over 5 years away from the policy change. All the estimated coefficients before same-sex marriage legalization are not statistically significant from zero, showing parallel trends in pre-treatment. The results of the event study, Figure 6
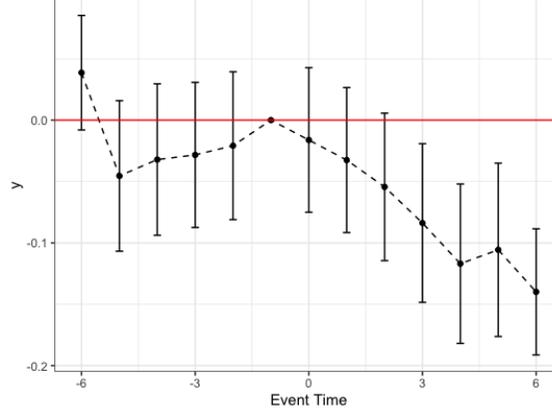

Figure 6: Event Study with country and year fixed effects

Our estimator assumes limited treatment anticipation, which implies no treatment effects before the treatment or the anticipation period is known. The assumption is represented by the following equation:

$$\mathbb{E}[Y_t(g)|G_g = 1] = \mathbb{E}[Y_t(0)|G_g = 1] \text{a.s. for all } g \in \mathcal{G}, t \in \{1, ..., \mathcal{T}\} \text{ such that } t < g - \delta \text{ and } \delta \geq 0. \quad (7)$$

Here, g represents the period when a unit first becomes treated. Despite the presence of anticipation in some of our treated groups, which can be attributed to the time differences between the passing of legislation and its implementation, our estimation remains identified under this assumption. We use two analyses. The first is by changing the value of δ that would satisfy the accommodate the largest time difference between legislative change and policy taking effect, 3 years. Changing the value of δ would change the reference from one year before the policy took effect to three years. This would lead the results not to include effects for the Netherlands, as the reference year would lie outside the range of our data. The overall effects estimates with $\delta = 3$ is -0.0306 (P<0.05)

Secondly, we study the effects of anticipation and the unobservable changes in admission during the anticipation years. Using analysis, changing the treatment year to the year the policy changed, not the year it took effect. The overall results indicate a decrease (-0.0647), and statistical significance (P<0.05). We examined groups of countries with anticipation periods between the years the legislation passed and the year it took effect. Figure 7 shows the effects in the anticipation years and year 0 for the group of counties. The estimates show the effect estimates were statistically insignificant and close to zero.
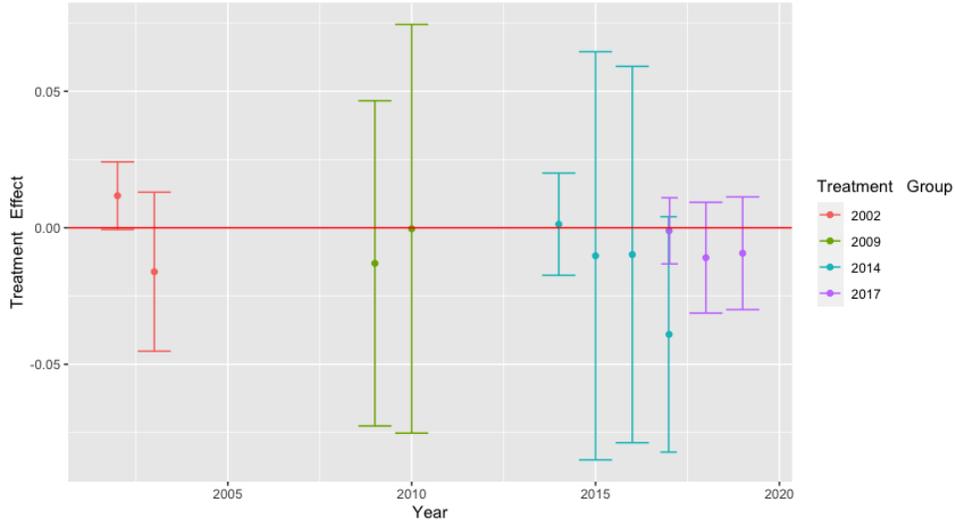

Figure 7: Results with Treatment Time on Legislation Passing

For our second question, we estimate equation 2. The estimates of β_{j1} and β_{j2} are shown in Table 2. The estimates of β_{j1} are negative, which aligns with the with the results discussed above, however they are not statistically significant. The estimates for β_{j2} are how the values change after 2013, and the effects are positive. The positive estimates suggest US policies that support same-sex marriages lower the impact of decreased admissions due to home EU marriage enactments. The heterogeneity of the treatment effects can influence the estimated change, but the change in the treatment effect is observed in the estimated $ATT_{g,t}$ for each group. The estimated values increase after 2013. This suggests that even when accounting for heterogeneity, The US recognition of

13

same-sex marriages led to a lower decline in admissions of EU skilled workers from countries with marriage equality. The effects of the federal same-sex marriage legalization in 2015 were not found to have statistically significant effects.

Table 2: Two-way fixed effects results

	Dependent variable:	
	H1B admissions per 1,000 of the labor force	
	(1)	(2)
Year 1-2	0.004	-0.008
	(0.020)	(0.020)
Year 3-4	-0.018	-0.022
	(0.024)	(0.027)
Year 5-6	-0.031	-0.037
	(0.028)	(0.037)
Year 7+	-0.040	-0.051
	(0.028)	(0.044)
Year 1-2 after 2013	0.059**	0.057**
	(0.026)	(0.025)
Year 3-4 after 2013	0.059**	0.030
	(0.029)	(0.029)
Year 5-6 after 2013	0.028	-0.014
	(0.034)	(0.034)
Year 7+ after 2013	0.033	-0.019
	(0.024)	(0.028)
Observations	540	540
Year^2	No	Yes
R^2	0.968	0.975
Adjusted R^2	0.962	0.968
Residual Std. Error	0.055 (df = 459)	0.050 (df = 433)
F Statistic	171.398*** (df = 80; 459)	156.273*** (df = 106; 433)

Note:	*p<0.1; **p<0.05; ***p<0.01

Robustness

To ensure the robustness of the results, we do three types of robustness checks. The first a placebo test using the data for visitor visa, which are not expected to change. Second, we redo the analysis using the total number of admissions. Third, we use the not-yet-treated countries as the control. For the placebo test, we used visitor visas B1 and B2. The primary distinction between these two visas lies in the purpose of the visit, with B1 intended for work and B2 for tourism. The increased access to marriage is not expected to affect either type of travel. Figure 8 and Figure 9 show the estimated dynamic effects, which are not statistically significant, and the aggregated effects are 0.1662 (p=0.527) and 0.941 (p=0.279), which are not statistically significant.
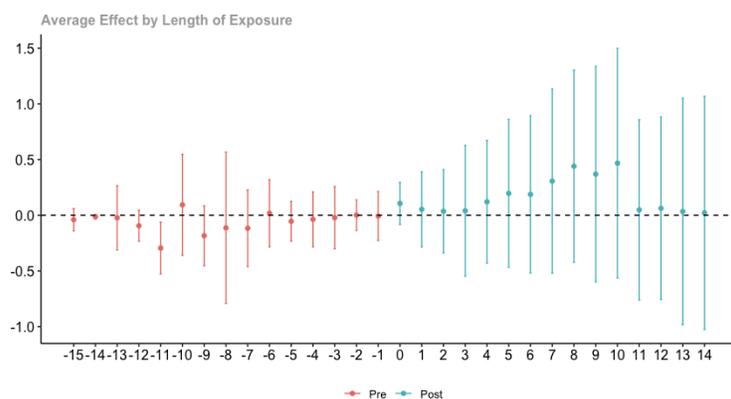

Figure 8: The Effect of Marriage Equality on Business Visitor Visa B1 Admission
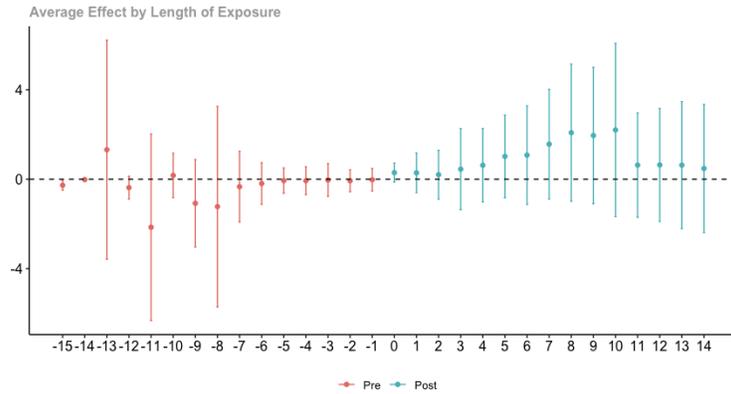
Figure 9: The Effect of Marriage Equality on Tourist Visitor Visa B2 Admission per 1,000 of Labor Force

The second test we conduct pertains to the effect of normalizing admissions by the labor force population. We employ the same estimation strategy on the number of admissions while controlling for the labor force population. The results reveal a statistically significant average treatment effect of -1085.715 (P<0.05). The event study shows a significant decrease in years 4, 6, 7, 8, 10, and after year 14, as illustrated in the figure 10. The point estimates indicate a more pronounced effect over time since the enactment of marriage equality. For instance, there is a decrease of 472 admissions in year 4, 995 in year 10, and 2000 in year 16 following the introduction of marriage equality.
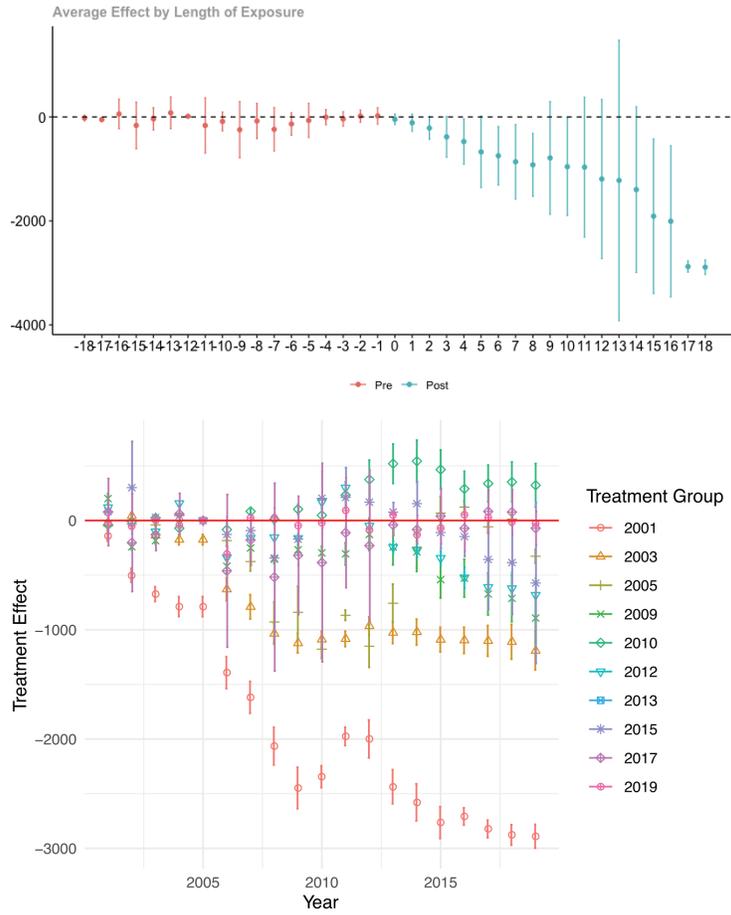
Figure 10: The Effect of Marriage Equality on the Total Number of H1B Visa Admission

In the two-way fixed effects, Table 3, we find similar results for the total number of admissions with a decrease of 591 (p<0.05) admissions in years 5 and 6 after the policy change, with the estimate flipping direction with an increase by 549.443 (p<0.05) in the interacted term in the same years after 2013.

Table 3: Two-way fixed effects results

	Dependent variable:	
	H1B	
	(1)	(2)
Year1-2	−197.622*	-209.632
	(119.113)	(134.432)
Year 3-4	−300.829**	−304.172*
	(143.288)	(179.349)
Year 5-6	−591.303***	−627.729***
	(173.096)	(241.145)
Year 7+	−475.981***	−511.127*
	(170.595)	(290.613)
Year 1-2 after 2013	597.400***	585.315***
	(155.047)	(162.321)
Year 3-4 after 2013	655.180***	634.352***
	(176.197)	(188.065)
Year 5-6 after 2013	549.443***	558.873**
	(205.200)	(222.416)
Year 7 + after 2013	321.617**	222.328
	(148.667)	(182.965)
Observations	540	540
$year^2$		yes
R^2	0.990	0.991
Adjusted R^2	0.989	0.989
Residual Std. Error	332.504 (df = 459)	328.593 (df = 433)
F Statistic	587.502*** (df = 80; 459)	454.364*** (df = 106; 433)

Note: *p<0.1; **p<0.05; ***p<0.01

The final check is checking for the possible heterogeneity between the treated group and the never treated group. When redoing the main analysis again, but only using countries that legalized marriage equality in the years preceding the policy change as the control. The aggregated effects
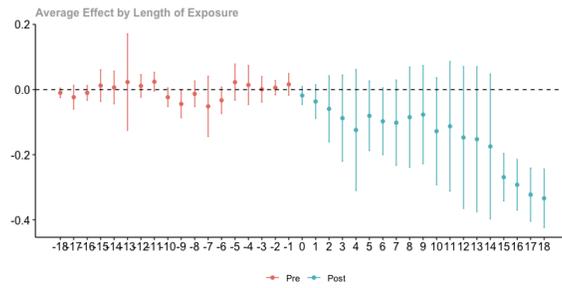
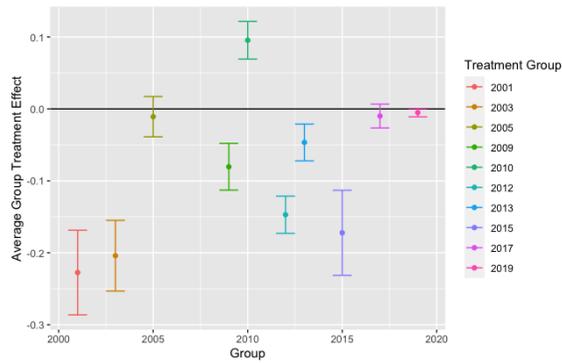Figure 11: Time Treatment Effects with the not-yet Treated Countries as Control

Figure 12: Group Treatment Effects with the not-yet Treated Countries as Control

by time, and group are -0.1421 (p<0.05), and -0.0723 (p<0.05) respectively. The time effects lose some of the statistical significance due to the lower number of observations. However, the results are consistent with the results from using the never-treated countries as the control. Figures 11 12 show the dynamic and group treatment effects.

Discussion

Our results show a significant decrease of 22% from the average. The estimated values are large compared to the number of individuals identifying as LGBTQ+ EU countries. A survey of EU citizens estimates the LGBTQ+ population at 6% (European Union Agency for Fundamental Rights, 2020). The large effects can be explained through three mechanisms. The first is the expected higher percentage of individuals in same-sex relationships within the H1B population due to a

higher representation of graduate degree holders. The second mechanism is the yearly compounding of the effects. We estimate the average effects over time. This means year-to-year effects are compounded, which explains the increase in the magnitude of the effects over time. It can also explain the high estimates. The final mechanism is that the effects extend to individuals not in same-sex relationships. In previous work, marriage equality was shown to affect interstate migration decisions of opposite-sex households (Badgett et al., 2021). Finally, The estimates of admissions decrease exceed the number of new yearly H1B petitions from most of the EU countries with marriage equality (U.S. Citizenship and Immigration Services, 2019). The difference suggests that marriage equality affects not only new H1B visa holders but also existing visa holders.

Our analysis has a major limitation. The first is the inability to track individuals' visa status. This means individuals switching from an H1B visa to another visa type, such as a spousal visa. This would result in a decrease in H1B visa admissions but not the number of skilled workers in the US. Such a change would bias our results downward. However, spousal visas were not possible before 2013. Our estimate showing the US recognition of same-sex marriage negated the loss in skilled labor admissions, which might be an underestimation of the US policy effects.

Conclusion

Marriage equality and the recognition of same-sex marriages come with social and legal benefits. Those benefits play an incentive to attract and retain skilled labor. In this paper, we study the effects of same-sex legalization in Europe on the inflow of European skills into The US. We find that EU countries with marriage equality led to an average 22% decrease in their skilled labor admissions to the US. We also study how the US recognition influenced these effects. We find US recognition of same-sex marriages leads to the retention of skilled labor in the US and negates the decrease resulting from EU countries enacting marriage equality. Overall, our results suggest that marriage equality and its recognition can help countries attract and retain skilled workers.

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