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Same-Sex Marriage Laws and Demand for Mortgage Credit

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Same-Sex Marriage Laws and Demand for Mortgage Credit

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Marriage for same-sex couples was only permitted in a limited number of states prior to the U.S. Supreme Court's 2015 decision in Obergefell v. Hodges. We exploit this variation across states prior to the Supreme Court decision to investigate the effect of marriage laws on demand for mortgage credit. Identification relies on the fact that states permitted same-sex marriage at different points in time, often through court order whereby the outcome and timing of ruling was unknown. We estimate that states permitting same-sex marriage experienced an 8 to 13 percent increase in same-sex mortgage applications after the policy was implemented.

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I. Introduction

On June 26, 2015 the Supreme Court ruled in *Obergefell v. Hodges* (576 U.S. ___ (2015), Docket No. 14-556) that same-sex couples have the right to marry in the United States. That decision capped a decade of piecemeal yet remarkable change in state same-sex marriage laws. Beginning with Massachusetts in 2004, each state pursued a different path towards marriage equality. Some voluntarily implemented same-sex marriage laws through legislation or voter initiatives. Others were forced to repeal bans on same-sex marriage by state and federal courts.

Nevertheless, the extension of the right-to-marry provided many benefits to gay and lesbian households that had previously been available only to heterosexual couples. Many of these benefits affect household formation and tenure choice. Certain benefits available through marriage can lower the cost of homeownership and thus could increase the demand for mortgage credit.

To test this hypothesis and identify the causal effect of marriage laws on the demand for mortgage credit we exploit the sporadic implementation of state same-sex marriage laws prior to the *Obergefell v. Hodges* ruling, often through court order in which the outcome and timing of ruling was unknown. Variation in timing is commonly used in the literature to estimate the causal impact of policy on economic outcomes (Autor et al. 2006; Adams and Cotti 2008). The strategy allows us to mitigate potential selection bias and estimate the response to the policy.

We estimate that states that introduced same-sex marriage experienced a roughly 8 to 13 percent increase in same-sex mortgage applications depending on the model specification and sample restriction. We also consider two additional policy changes that occurred concurrently with the enactment of same-sex marriage laws. We find positive and significant results for overturning Section 3

of the Defense of Marriage Act (DOMA) but no statistically significant effect of civil unions on the demand for mortgage credit.

Becker (1981) was the first to discuss the economics of households, including same-sex households, in the seminal work *A Treatise on the Family*. Subsequent work (Black et al. 2007) examines same-sex households under different laws and cultures. Our work furthers this research and gains important insight into the economics of the same-sex household.

To our knowledge, this paper is the first to describe the pathways through which same-sex marriage laws are thought to increase same-sex mortgage applications. The paper is also the first to use the HMDA dataset to examine the pattern of same-sex mortgage applications over time and exploit state variation to estimate the causal effect of changes in same-sex marriage laws on same-sex mortgage applications. The findings further our understanding of the economics of the same-sex household at a crucial point in time in the evolution of legal equality and social acceptance.

II. Homeownership and the Economics of Same-Sex Households

Differences in homeownership rates between same-sex couples and married opposite-sex couples are not fully explained by differences in characteristics traditionally associated with homeownership such as income or education (Jespen and Jespen 2002; Leppel 2007a; Leppel 2007b). Instead, one plausible explanation for the same-sex homeownership gap is disparate treatment of same-sex couples, including being denied the legal and economic benefits of the institution of marriage.

The positive relationship between marital status and homeownership is well documented (Hoyt and Rosenthal 1990; Ioannides and Rosenthal 1994). Marriage encourages investments in marriage-specific capital including spouse's education,

children, household specialization, and homeownership (Becker 1981; Stevenson 2007). More particularly for homeownership, marriage creates an explicit contract that protects both parties from lien by creditors of a spouse and transfers property automatically without probate to a surviving spouse in the event of death.[1] For example, in a related Supreme Court ruling, *United States v. Windsor* (570 U.S. ___ (2013), Docket No. 12-307), the Supreme Court ruled that Section 3 of DOMA was an unconstitutional violation of the due process clause of the Fifth Amendment. The petitioner, Edith Windsor, was prevented under the law from claiming a spousal exemption from the estate tax worth $363,053 after the death of her long-time partner and wife as recognized by the state of New York.

Further, favorable treatment of homeownership by the federal tax system has been shown to have a direct effect on tenure choice (Rosen and Rosen 1980). Marriage laws affect housing demand by reducing the cost of homeownership through at least two tax expenditures; the mortgage interest deduction and capital gains exemption. Although the mortgage interest deduction and capital gains expenditures are available to married and unmarried homeowners, the reporting requirements for unmarried couples are more burdensome. Unmarried couples must carefully document ownership interest and mortgage payments to fully qualify.

III. Data

The Federal Financial Institutions Examination Council (FFIEC) annually compiles information collected from financial institutions on home mortgage lending activities as required under the Home Mortgage Disclosure Act (HMDA) of 1975. Since revisions in 2004 to Regulation C that implements HMDA, the

1 The distribution of property in the event of death is a complicated process for any couple. This was certainly so for same-sex couples without the benefit of the legal structure that marriage provides. Any couple contemplating joint purchase of property would be well-advised to carefully consider estate planning and seek legal advice.

loan-application register that each financial institution is required to submit included information on the loan purpose and lien status as well as the property type and occupancy. This paper focuses on non-business[2] first-lien mortgage applications for purchase of owner-occupied, one-to-four unit properties. We examine mortgage applications from the beginning of 2004 until September 30, 2014.[3]

HMDA data is unique for several reasons. First, disclosure is required for loan originations as well as applications denied by the financial institution. Loan applications provide a more accurate measure of demand for mortgage credit than loan originations, which are influenced by the changes in underwriting standards and possible disparate treatment by mortgage lenders.

Second, HMDA has the most complete coverage of the mortgage market of any database. The U.S. Department of Housing and Urban Development (2011) estimates that HMDA covers between 75 and 85 percent of conventional (i.e., not government-insured) loan originations and between 90 and 95 percent of FHA-insured originations.

Finally, HMDA data include information on applicant characteristics, such as race, ethnicity, and sex. HMDA is traditionally used to investigate the possibility of disparate treatment and redlining, in which minority applicants and neighborhoods are underserved by mortgage lenders (e.g., Dedman 1988; Munnell et al. 1996). The sex of the applicant is examined less often and the characteristics of any co-applicants are often ignored. This paper uses the reported

[2] Following Bhutta and Canner (2013), business-related loans are identified as those where the race, ethnicity, and sex of the applicant or co-applicant are reported by the lender as "not applicable."

[3] We excluded the last three months of 2014 because applications are not reported under HMDA until they are acted upon. Consequently, some applications submitted toward the end of one calendar year may not be reported until the following year. Between 2004 and 2013, on average 73 percent of applications submitted in December were not acted on until the following calendar year and therefore not reported in the year the application was submitted. Comparable figures for November and October are 31 percent and 15 percent, respectively.

sex of the both the applicant and co-applicant to identify demand for mortgage credit from same-sex applicants. The complete typology is provided below:[4]

- Single (No co-applicant)
- Same-sex (Applicant and co-applicant of same sex)
- Opposite-sex (Applicant and co-applicant of opposite sex)
- Unknown (Co-applicant present but sex not reported)

According to the HMDA data, the number of first lien mortgage applications for purchase of owner-occupied site-built one-to-four unit properties from same-sex applicants fell by half between 2004 and the trough in 2011 (Table 1; Figure 1). But in the context of declines in all home purchase mortgage applications, the same-sex share has been relatively stable, ranging between 1.9 and 2.6 percent over the last eleven years.

TABLE 1. AVERAGE ANNUAL MORTGAGE APPLICATIONS BY HOUSEHOLD TYPE (THOUSANDS)

	2004-2007	2008-2011	2012-2014[a]
Household Type			
Single Applicants	3,380	1,794	1,883
Same-Sex Applicants	112	78	73
Opposite-Sex Applicants	2,018	1,227	1,340
Unknown	145	97	87
All Applications	5,655	3,195	3,383
Same-Sex Share	2.0%	2.4%	2.2%

Source: Author calculations.

[a] Through September.

[4] A growing literature suggests the order of mortgage applicants (male-female or female-male) may provide insight into local sentiment on gender equality (Agarwal et al. 2015). As such we also considered a finer topology and found consistent results including splitting into male-male and female-female pairings.

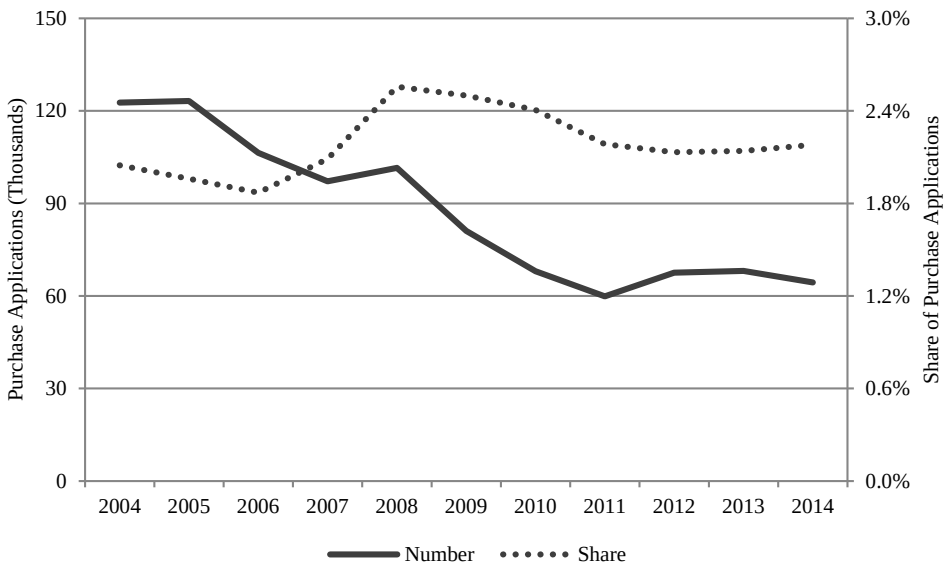

FIGURE 1. SAME-SEX MORTGAGE APPLICATIONS

Source: Author tabulations of Home Mortgage Disclosure Act data.

Admittedly, same-sex applications do not uniquely capture demand for mortgage credit for couples in a same-sex relationship. Applicants and co-applicants could be of the same sex but of another relationship, such as a father co-signing on his son's mortgage application. In addition, same-sex households may have misreported sex of applicants or simply omitted a potential co-applicant because of social stigma and fear of discrimination. In spite of the inability to specifically identify applications from same-sex households, the same-sex share of applicants observed in the HMDA dataset in a state is correlated (ρ=0.714) with the same-sex share of owner-occupied households estimated from the American Community Survey (ACS) public use microdata (Figure 2).[5] The correlation suggests that the applicant and co-applicant characteristics are indicative of household type.

5 Same-sex households are identified in the American Community Survey as households where a husband, wife or unmarried partner reported the same-sex as the reference person.

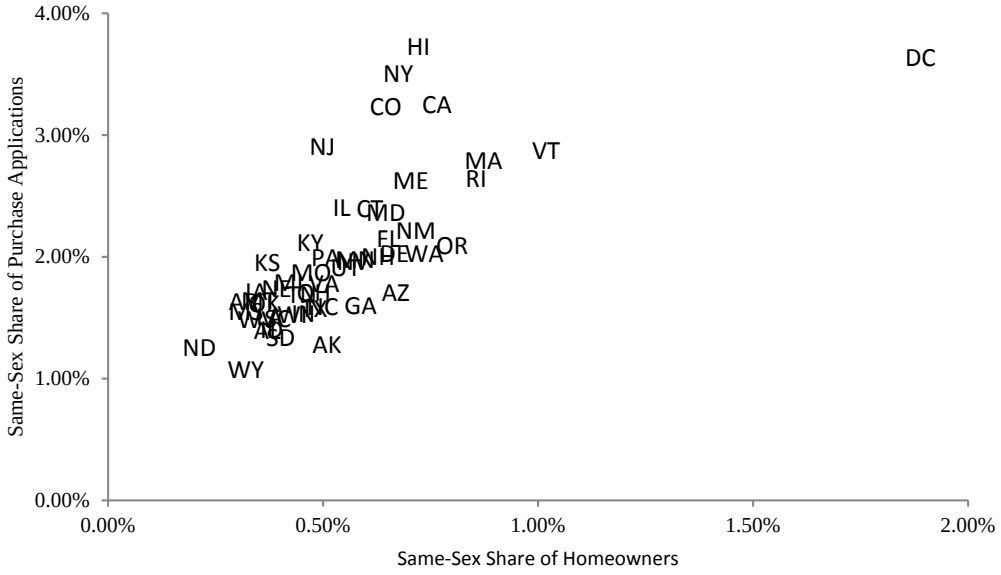

FIGURE 2. SAME-SEX SHARE OF HOMEOWNERS AND MORTGAGE APPLICANTS BY STATE (2011-13)

Source: Author tabulations of American Community Survey Public Use Microdata and Home Mortgage Disclosure Act data.

IV. Methods and Results

The variation in timing and method of implementation of same-sex marriage laws is crucial to our identification strategy. Table 2 provides a list of the 36 states and District of Columbia that permitted same-sex marriages prior to the *Obergefell v. Hodges* decision, the dates the laws went into effect, and the method of implementation. The first state to permit same-sex marriages was Massachusetts in 2004. By the end of our study period, nineteen states and the District of Columbia permitted same-sex marriage. We model the effect of implementing same-sex marriage on the number of home purchase mortgage applications from applicants of the same sex using fixed effects (FE), difference-in-difference (DD) and difference-in-difference-in-difference (DDD) models.

TABLE 2. MARRIAGE EQUALITY CHRONOLOGY PRIOR TO OBERGEFELL V. HODGES

State	Same-Sex Marriage	Implementation Type	Civil Union
Alabama	2/9/2015	Court Order	
Alaska	10/12/2014	Court Order	
Arizona	10/17/2014	Court Order	
California	6/28/2013	Court Order	
Colorado	10/6/2014	Court Order	5/1/2013
Connecticut	10/10/2008	Court Order	10/1/2005
Delaware	7/1/2013	Legislation	1/1/2012
District of Columbia	3/9/2010	Legislation	
Florida	1/6/2015	Court Order	
Hawaii	11/13/2013	Legislation	1/1/2012
Idaho	10/15/2014	Court Order	
Illinois	6/1/2014	Legislation	1/31/2011
Indiana	10/6/2014	Court Order	
Iowa	4/3/2009	Court Order	
Maine	11/6/2012	Voter	
Maryland	1/1/2013	Legislation	
Massachusetts	5/17/2004	Court Order	
Minnesota	8/1/2013	Legislation	
Montana	11/19/2014	Court Order	
Nevada	10/9/2014	Court Order	
New Hampshire	1/1/2010	Legislation	1/1/2008
New Jersey	10/21/2013	Court Order	2/19/2007
New Mexico	12/19/2013	Court Order	
New York	7/24/2011	Legislation	
North Carolina	10/10/2014	Court Order	
Oklahoma	10/6/2014	Court Order	
Oregon	5/19/2014	Court Order	
Pennsylvania	5/20/2014	Court Order	
Rhode Island	8/1/2013	Legislation	7/1/2011
South Carolina	11/20/2014	Court Order	
Utah	10/6/2014	Court Order	
Vermont	4/7/2009	Legislation	7/1/2000
Virginia	10/6/2014	Court Order	
Washington	11/6/2012	Voter	
West Virginia	10/9/2014	Court Order	
Wisconsin	10/6/2014	Court Order	
Wyoming	10/21/2014	Court Order	

Source: Los Angeles Times - Timeline Gay marriage chronology; National Conference of State Legislatures.

In addition to policy indicators of same-sex marriage, we include several time-varying state-level controls identified in the literature (Rosen 1980). The control variables are grouped into three categories: employment conditions, housing affordability, and housing market expectations (see Table 3).

Employment Conditions: Household formation and demand for mortgage credit is related to employment conditions (Paciorek 2013). We measure the strength of the labor market in a state by both the monthly unemployment rate and change in the level of employment from the previous month. State level employment and unemployment information is obtained from the Bureau of Labor Statistics.

Housing Affordability: Housing affordability is often measured by the ratio of mortgage debt payments to potential homeowner's income. We estimate a general housing cost to income (HTI) ratio by applying prevailing mortgage rates to state-level estimates of house prices[6] and wages. Mortgage payments are calculated assuming an 80 percent loan-to-value ratio, fixed mortgage interest rates, a 30 year amortization term and the cost of points spread over five years. Mortgage interest rates and points are obtained from Freddie Mac's Primary Mortgage Market Survey (PMMS). Monthly income is based on the average weekly wages reported in the Quarterly Census of Employment and Wages (QCEW).

Housing Market Expectations: Expectations about the strength of the housing market are captured by two measures. First, year-over-year change in house prices, as measured by changes in FHFA's quarterly house price index. Expectations of future house price appreciation that influence household behavior are found to be correlated with such backward-looking extrapolative heuristics (Mayer and Sinai 2007; Granziera and Kozicki 2012). Second, housing market expectations are also measured by the monthly number of (logged) new building permits in a given state. Building permits reflect home builder expectations of future housing market conditions, which may be assumed to be correlated with household expectations.

6 Housing values are estimated by adjusting the median value of owner-occupied homes in the 2006-2010 ACS by the state-level repeat-sales house price index (HPI) created by the Federal Housing Finance Agency (FHFA).

New Housing Supply: We also account for changes in the housing stock that might affect the number of homes available to purchase. We use a 12 month lag[7] in permits as a measure of new housing stock available for purchase.

We include various fixed effects and time trends. State fixed effects capture time invariant factors unique to each region. Year and month fixed effects capture time specific changes common across all states such as seasonality in demand for mortgage credit. Linear applicant type- and state-specific time trends are also incorporated to address secular trends in mortgage applications that would have existed regardless of whether states permitted same-sex marriage.

TABLE 3. AVERAGE STATE MONTHLY ECONOMIC CONDITIONS, 2004-2014

Building Permits (000s)	1.89
	(2.85)
Housing Cost to Income Ratio	24.5
	(11.3)
Unemployment Rate	6.3
	(2.2)
Monthly Change in Employment	0.05
	(0.21)
Annual Change in House Prices	2.4
	(7.4)

Notes: Standard deviations in parentheses.

Source: Author calculations.

A. Fixed Effects Model

First, we employ a fixed effects (FE) model using variation in timing of implementation of same-sex marriage laws to measure the causal effect on the number of home purchase mortgage applications. Equation (1) shows the FE model.

[7] According to the Census Bureau, the length of time from authorization to completion of new single-family privately owned residential buildings between 2004 and 2014 ranges between 6.7 and 8.9 months, with multi-family buildings ranging between 12 and 16.7 months.

(1)

$$\ln(Applications_{st}) = \alpha_s + \delta SSM_{st} + \beta X_{st} + \gamma_1 Year_t + \gamma_2 Month_t + \gamma_3 Trend_{st} + \varepsilon_{st}$$

The outcome variable is the natural log[8] of home purchase mortgage applications in state (s) in time period (t). The policy variable of interest (SSM) is equal to one if state s allowed same-sex marriages during year and month t and zero otherwise.

The first column of Table 4 presents the results of the FE model using all home purchase mortgage applications. The controls for economic conditions are all statistically significant at least at the 5 percent level and in the anticipated direction. A one percent increase in building permits increases home purchase mortgage applications by 8 percent in the current month and just over 1 percent a year later. A one percentage point increase in the HTI ratio causes applications to fall roughly half a percent. Similarly, a one point year-over-year increase in house prices is associated with an increase in application of roughly half a percent. A one percentage point increase in the unemployment rate causes applications to fall 3 percent while a one percent month-over-month increase in employment is associated with over an 11 percent increase in applications.

8 Because the dependent variable is logged, estimated effects are discussed as percentage changes based on the exponeniated values of the coefficients (i.e., $\%\Delta=(e\beta-1)\times100$). To avoid dropping observations with no applications in a given month, we add one to all application counts before taking the natural log in this and all subsequent models.

TABLE 4. SAME-SEX MARRIAGE; FIXED EFFECTS MODEL

	(1) All Applications		(2) Same-Sex Applicants	
	Coeff.	Std. Err.	Coeff.	Std. Err.
Same-Sex Marriage	0.0044	0.0152	0.0835**	0.0318
Economic Conditions				
Building Permits (Log)	0.0801***	0.0241	0.0591**	0.0236
12-Month Lag	0.0129**	0.0055	0.0115	0.0081
House Price-to-Income Ratio	-0.0056***	0.0019	-0.0045	0.0037
Unemployment Rate	-0.0321***	0.0056	-0.0311***	0.0090
Monthly Change in Employment	0.1074***	0.0306	0.1014***	0.0340
Annual Change in House Prices	0.0045***	0.0013	0.0005	0.0018
N	6,579		6,579	
F	841.5		199.8	
Within R^2	0.9105		0.7073	
Adjusted Within R^2	0.9094		0.7038	

Notes: Robust standard errors. State time trends, and state, year and month fixed effects not shown.

Source: Author calculations.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

We find that the coefficient of interest, same-sex marriage, is small and positive. The result, however, is not significantly different from zero. It is not entirely surprising that we find an effect from same-sex marriage laws that is not statistically significant on the entire volume of mortgage applications as same-sex mortgage applications represent a small share of the market. The second column shows the results from restricting the population to same-sex applicants. We find that the implementation of a same-sex marriage law increased same-sex mortgage applications 8.4 percent and is statistically significant at the 5 percent level.

B. Differences-in-Differences Model

The estimation strategy can be improved by employing a difference-in-difference (DD) model in which other applicant types serve as a counterfactual to

changes in same-sex applications. Specifically, the relative change in the volume of same-sex mortgage applications after the implementation of same-sex marriage is compared the equivalent relative changes in states and months where the law regarding same-sex marriage did not change.

Equation (2) shows the DD regression model.

(2)

$$\ln(Applications_{ist}) = \alpha_{is} + \delta_1 SSM_{st} + \delta_2(Type_i \times SSM_{st}) + \beta X_{st} + \gamma_1 Year_t + \gamma_2 Month_t + \gamma_3 Trend_{st} + \gamma_4 Trend_{ht} + \varepsilon_{ist}$$

The outcome variable in equation (2) is the natural log of mortgage applications by a given applicant type (i) in state (s) at period (t). Applicant types are the four possible combinations of applicants and co-applicants based on sex. The coefficient δ_2 on the interaction of the policy variable SSM and applicant type captures any disproportionate change in applications among certain applicant types (e.g., same-sex applicants) in a state at the time same-sex marriage became legal (i.e., the DD estimator). Single applicants (no co-applicants) are used as the reference group.

The first column of Table 5 presents the results of the DD estimation for all states. Eleven years of monthly data, 50 states and the District of Columbia, and four different applicant types yields 26,316 observations. The coefficients on state-level time-varying economic conditions all have anticipated signs and are similar in magnitude to the estimates from the previous FE estimation. Coefficients on economic conditions are also all statistically significant with the exception of 12 month lag in building permit activity.

TABLE 5. SAME-SEX MARRIAGE; DIFFERENCES-IN-DIFFERENCES MODEL

	(1) All States		(2) Court Order		(3) Early Adopters	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Same-Sex Marriage	-0.0196	0.0242	-0.0633**	0.0302	-0.0348	0.0329
× Opposite-Sex	0.0442	0.0299	0.0528	0.0360	0.0501	0.0393
× Same-Sex	0.0866**	0.0390	0.1252***	0.0334	0.1291**	0.0525
× Unknown	-0.0179	0.0450	-0.0209	0.0493	0.0195	0.0585
Economic Conditions						
Building Permits (Log)	0.0725***	0.0123	0.1093***	0.0087	0.0699***	0.0133
12-Month Lag	0.0075	0.0052	0.0083	0.0074	0.0071	0.0057
House Price-to-Income Ratio	-0.0060***	0.0016	-0.0081***	0.0020	-0.0045**	0.0018
Unemployment Rate	-0.0347***	0.0046	-0.0359***	0.0055	-0.0365***	0.0052
Monthly Change in Employment	0.1141***	0.0188	0.0881***	0.0190	0.0979***	0.0194
Annual Change in House Prices	0.0043***	0.0010	0.0040***	0.0011	0.0042***	0.0012
N	26,316		20,124		20,640	
F	362.5		1011.9		451.9	
Within R2	0.7507		0.7600		0.7411	
Adjusted Within R2	0.7499		0.7592		0.7402	

Notes: Robust standard errors. State time trends, and state, year and month fixed effects not shown.

Source: Author calculations.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

The estimated change in the number of home purchase mortgage applications in the reference group (single applicants) associated with same-sex marriage laws was negative but not statistically significant. Further, the interaction between applicant type and same-sex marriage shows that mortgage applications from opposite-sex applicants and applications where the sex of the applicants was not reported did not change significantly relative to applications from single applicants. On the other hand, same-sex marriage mortgage applications are 9 percent higher in months that states permitted same-sex marriage relative to applications from single applicants. The coefficient is significant at the 5 percent level.

There are potential threats to identification in DD estimation as detailed in Meyers (1995). The most important concern is that of policy endogeneity: the

possibility that state laws are responding to a population of interest rather than that population responding to changes in state laws. Vermont, for example, was the first state to implement civil unions in 2000 that extended many of the benefits of marriage to same-sex couples. In 2009, Vermont became the fourth state to permit same-sex couples the right-to-marry and the first through the legislative process. Vermont is also the state with the highest same-sex share of homeowners. It is possible that changes in Vermont's same-sex marriage law was a response to a demand from same-sex households within the state for the legal protections that come with marriage, including legal benefits that relate to homeownership. This would produce an estimated effect of same-sex marriage that is upwardly biased.

Same-sex marriage permitted by court order rather than legislative action or voter initiative has a stronger argument for exogeneity. Prior to the 2015 the majority of states (23), implemented same-sex marriage laws through court order for which the outcome was not assured and timing of implementation was unknown. The second column of Table 5 shows the results of the DD estimation after excluding states that implemented same-sex marriage in the study period by legislation or voter initiative. The remaining eight states that implemented same-sex marriage in the study period were required to do so by judicial decree. The coefficient on the interaction between same-sex applicants and the implementation of same-sex marriage is even stronger in this sample of states. The court mandated implementation of same-sex marriage is associated with a 12.5 percent increase in home purchase applications relative to the applications with no co-applicant. The finding is statistically significant at the 1 percent level.

Another concern is that the concentration of policy changes toward the end of the period of observation prevents adequate measurement of post-intervention applicant behavior and whether any increase in demand for mortgage credit is temporary or persistent. The third column of Table 5 presents the results of the

DD model after excluding states that implemented same-sex marriage after 2012. The implementation of same-sex marriage in the remaining nine "early adopters" is associated with a 12.9 percent relative increase in home purchase mortgage applications from same-sex applicants. The finding is statistically significant at the 5 percent level.

A supplementary model (not shown) includes the number of months since the implementation of same-sex marriage as well as the binary policy indicator.[9] The estimated coefficient on the interaction with same-sex applicants is negative but not statistically significant while the estimated coefficient on original policy variable is not meaningfully altered. This suggests that the change in mortgage applications from same-sex applicants in response to same-sex marriage is a persistent increase rather than a temporary spike driven by pent-up demand.

Table 6 shows the results of replacing the policy variable SSM in the DD model with a binary indicator of civil unions. Civil unions offer a legal alternative to marriage that may also affect the behavior of same-sex households. However, the Internal Revenue Service (IRS) maintains that "the term 'marriage' does not include registered domestic partnerships, civil unions, or other similar formal relationships recognized under state law that are not denominated as a marriage under that state's law" (Rev. Rul. 2013-17). Given the importance of federal tax expenditures to the cost of homeownership, same-sex couples may be less responsive to civil unions with regard to purchasing a home. The coefficient on the interaction with applicant type shows civil unions do not produce a statistically significant change in home purchase mortgage applications from same-sex applicants. The finding holds even if indicators for both same-sex marriage and civil unions are estimated in the same model.

9 Results for the supplementary model are provided upon request.

TABLE 6. CIVIL UNIONS; DIFFERENCES-IN-DIFFERENCES MODEL

	Coeff.	Std. Err.
Civil Union	-0.0169	0.0329
× Opposite-Sex	0.0189	0.0403
× Same-Sex	0.0137	0.0464
× Unknown	0.0348	0.0424
Economic Conditions		
Building Permits (Log)	0.0726***	0.0122
12-Month Lag	0.0075	0.0052
House Price-to-Income Ratio	-0.0060***	0.0015
Unemployment Rate	-0.0347***	0.0046
Monthly Change in Employment	0.1140***	0.0188
Annual Change in House Prices	0.0043***	0.0010
N	26,316	
F	352.9	
Within R2	0.7502	
Adjusted Within R2	0.7494	

Notes: Robust standard errors. State time trends, and state, year and month fixed effects not shown.

Source: Author calculations.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Finally, in a falsification test (not shown), we randomly assign same-sex marriage to 20 states and then randomly assign the timing of implementation to a date within the study period.[10] The results show that this randomized policy variable and its interaction with applicant type is not statistically significant.

C. Differences-in-Differences-in-Differences Model

The repeal of Section 3 of DOMA provides another source of variation with respect to same-sex marriage laws.[11] The benefit and portability of same-sex marriage was limited as long as the federal Defense of Marriage Act of 1996

10 Results from the falsification test are provided upon request.

11 We model the effect of overturning DOMA as occurring in September 2013 even though the Supreme Court ruling was June 26. The IRS did not issue guidance on federal taxation until August 29 and the Department of Defense did not issue guidance on veterans' benefits until September 3.

(DOMA) was in effect. Section 3 of DOMA stated that for purposes of federal regulations "the word `marriage' means only a legal union between one man and one woman as husband and wife, and the word `spouse' refers only to a person of the opposite sex who is a husband or a wife." DOMA hindered same-sex spouses from benefiting from certain federal tax expenditures, including benefits that affect the cost of homeownership. In *United States v. Windsor* (570 U.S. ___ (2013), Docket No. 12-307), the Supreme Court ruled that Section 3 of DOMA was an unconstitutional violation of the due process clause of the Fifth Amendment. Overturning Section 3 of DOMA opened federal benefits to same-sex households. The U.S. Government Accountability Office (GAO) identified a total of 1,138 federal statutory provisions in which marital status was a factor in receiving benefits, rights, and privileges (GAO 2004).

Concerns about policy endogeneity should be ameliorated because this change in national policy was prompted by a Supreme Court ruling but should nevertheless affect states differently based on existing marriage laws. Equation (3) shows the differences-in-differences-in-differences (DDD) regression model.

(3)

$$\ln(Applications_{ist}) = \alpha_{is} + \delta_1 SSM_{st} + \delta_2(Type_i \times SSM_{st}) + \delta_3 DOMA_t + \delta_4(Type_i \times DOMA_t) + \delta_5(SSM_{st} \times DOMA_t) + \delta_6(Type_i \times SSM_{st} \times DOMA_t) + \beta X_{st} + \gamma_1 Year_t + \gamma_2 Month_t + \gamma_3 Trend_{st} + \gamma_4 Trend_{ht} + \varepsilon_{ist}$$

Equation (3) captures both the DD estimate of enacting same-sex marriage but also the effect of overturning DOMA in states that had implemented same-sex marriage, represented by the coefficient δ_6 on the interaction between DOMA, SSM and Type.

TABLE 7. SAME-SEX MARRIAGE; DIFFERENCES-IN-DIFFERENCES-IN-DIFFERENCES MODEL

	(1) All States		(2) Court Order		(3) Early Adopters	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Same-Sex Marriage	-0.0095	0.0252	-0.0485*	0.0285	-0.0271	0.0322
× Opposite-Sex	0.0394	0.0325	0.0345	0.0293	0.0457	0.0379
× Same-Sex	0.0686	0.0507	0.1087***	0.0331	0.0973*	0.0565
× Unknown	0.0099	0.0468	0.0044	0.0430	0.0269	0.0558
DOMA Repeal	0.0194	0.0156	0.0140	0.0158	0.0079	0.0161
× Opposite-Sex	-0.0248	0.0203	-0.0208	0.0198	-0.0169	0.0204
× Same-Sex	-0.1115***	0.0274	-0.1045***	0.0283	-0.1025***	0.0292
× Unknown	-0.1077***	0.0355	-0.0742**	0.0362	-0.0827**	0.0381
× Same-Sex Marriage	-0.0546**	0.0232	-0.0543*	0.0284	-0.0685**	0.0279
× Opposite-Sex	0.0237	0.0310	0.0491	0.0372	0.0182	0.0342
× Same-Sex	0.0990**	0.0500	0.0841*	0.0440	0.1305**	0.0509
× Unknown	-0.0028	0.0514	-0.0199	0.0581	-0.0253	0.0535
Economic Conditions						
Building Permits (Log)	0.0721***	0.0122	0.1087***	0.0086	0.0697***	0.0133
12-Month Lag	0.0086*	0.0051	0.0096	0.0073	0.0081	0.0056
House Price-to-Income Ratio	-0.0056***	0.0016	-0.0077***	0.0021	-0.0038**	0.0019
Unemployment Rate	-0.0349***	0.0045	-0.0360***	0.0054	-0.0364***	0.0051
Monthly Change in Employment	0.1166***	0.0191	0.0906***	0.0193	0.0998***	0.0195
Annual Change in House Prices	0.0042***	0.0010	0.0039***	0.0011	0.0041***	0.0012
N	26,316		20,124		20,640	
F	407.2		903.1		494.3	
Within R2	0.7522		0.7611		0.7426	
Adjusted Within R2	0.7513		0.7601		0.7416	

Notes: Robust standard errors. State time trends, and state, year and month fixed effects not shown.

Source: Author calculations.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

The first three columns of Table 7 show the results of the DDD model for all states, states that implemented same-sex marriage by court order, and early adopters. Prior to the repeal of DOMA, the implementation of same-sex marriage was associated with an increase in home purchase mortgage applications from same sex applicants of between 6.9 and 10.9 percent, although the change in not statistically significant in the model using all states and only significant at the 10 percent level in the model using only early adopters. Same-sex applications in

states without same-sex marriage were not expected to be affected by *United States v. Windsor*, but the overturning of DOMA is associated with a statistically significant decline in same-sex mortgage applications of between 10.3 and 11.1 percent in these states. On the other hand, the overturning of DOMA is associated with an increase of 8.4 to 13.0 percent in states that had enacted same-sex marriage. The increase among early adopters is particularly notable given that these states had all implemented same-sex marriage prior to the Supreme Court decision, whereas the results in the first two columns confound the state implementation of same-sex marriage with the federal repeal of DOMA. As such, the effect of the repeal among early adopters constitutes a clear incremental increase in demand for mortgage credit in response to change in federal policy.

After *United States v. Windsor*, the IRS made many of the newly acquired federal benefits portable by recognizing "the validity of a same-sex marriage that was valid in the state where it was entered into, regardless of the married couple's place of domicile" (Rev. Rul. 2013-17). However, other federal benefits remained tied to residency. For example, veteran's spousal benefits require a marriage to be valid according to "the law of the place where the parties resided when the right to benefits accrued" (38 U.S.C. § 103(c)). Consequently, the Veterans Administration (VA) could only guarantee the veteran's portion of a mortgage loan even if a gay or lesbian veteran was legally married but resided in a state that did not recognize that same-sex marriage.

The residency-based eligibility requirement strengthens the DDD model because same-sex households could not be married in one state but apply for a VA guaranteed mortgage in another state that did not recognize that marriage. Table 8 shows the results of the DDD model using only applications for VA guaranteed home purchase mortgages.

TABLE 8. VA=GUARANTEED MORTGAGES; DIFFERENCES-IN-DIFFERENCES-IN-DIFFERENCES MODEL

	Coeff.	Std. Err.
Same-Sex Marriage	0.1892***	0.0638
× Opposite-Sex	-0.0030	0.0892
× Same-Sex	-0.2701***	0.0829
× Unknown	-0.3087***	0.0794
DOMA Repeal	0.0318	0.0278
× Opposite-Sex	0.1088***	0.0363
× Same-Sex	0.1093**	0.0502
× Unknown	-0.1014**	0.0469
× Same-Sex Marriage	-0.1285**	0.0514
× Opposite-Sex	-0.0414	0.0821
× Same-Sex	0.2702***	0.0819
× Unknown	0.1260	0.0804
Economic Conditions		
Building Permits (Log)	0.0482***	0.0121
12-Month Lag	-0.0113	0.0114
House Price-to-Income Ratio	-0.0215***	0.0058
Unemployment Rate	-0.0014	0.0078
Monthly Change in Employment	0.0632***	0.0189
Annual Change in House Prices	-0.0081***	0.0013
N	26,316	
F	306.4	
Within R2	0.5388	
Adjusted Within R2	0.5372	

Notes: Robust standard errors. State time trends, and state, year and month fixed effects not shown.

Source: Author calculations.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Although the coefficients for most of the controls for economic conditions remain similar to prior models, the unemployment rate is no longer statistically significant while the year-over-year change in house price is statistically significant, but the direction is reversed. These changes are likely the result of VA guaranteed mortgage lending filling the void left by conventional mortgage lenders in the aftermath of the housing crisis and therefore being inversely correlated with common indicators of demand for mortgage credit.

Contrary to the model of all mortgage applications, the state enactment of same-sex marriage prior to *United States v. Windsor* is associated with a 27.0 percent decrease in applications for VA-guaranteed home purchase mortgage loans. The difference may reflect same-sex applicants shifting from VA to a mortgage channel that can recognize their marriage. The repeal of Section 3 of DOMA is associated with an 10.9 percent increase in applications for VA-guaranteed mortgages in states without same-sex marriage and a larger 27.0 percent increase in states that recognize same-sex marriage. These changes are statistically significant at least at the 5 percent level.

V. Conclusion

The many benefits of marriage include better physical health, longevity, mental health, economic well-being, and child outcomes (Waite and Lehrer 2003). Additionally same-sex marriage laws are thought to increases household formation and demand for mortgage credit. In this paper we test the hypothesis that the introduction of same-sex marriage increases same-sex mortgage applications. We rely on data from the Home Mortgage Disclosure Act (HMDA) and state variation in same-sex marriage laws. This paper is to be first to our knowledge that exploits state variation in same-sex marriage laws to estimate the increase in same-sex mortgage applications.

Our analysis provides evidence that same-sex marriage laws increase the number of same-sex mortgage applications. We estimate that states with same-sex marriage experienced an increase in the number of same-sex mortgage applications of between 8 and 13 percent. We also consider the method of enactment, civil unions and the repeal of the Defense of Marriage Act (DOMA), and find that same-sex households respond to marriage equality by increasing demand for mortgage credit.

The Supreme Court's decision in *Obergefell v. Hodges* extended the right-to-marry to all same-sex households in the United States. The ruling also made existing same-sex marriages more portable by superseding Section 2 of DOMA, which allowed states to not recognize same-sex marriages performed in other states. These changes will likely further increase the demand for mortgage credit from same-sex households. However, because same-sex households constitute a small share of the market, the impact on the overall volume of market applications is unlikely to be dramatic. Further, our focus on the demand for mortgage credit does not consider the degree to which an increase in mortgage applications translates into actual loan originations or ultimately to an increase in homeownership.

The relatively small share of mortgage market should not discourage further study of the economics of the same-sex household. Instead the sudden introduction of marriage to a population previously denied that right provides important insight in the economics of all households.

D. References

Adams, Scott, and Chad Cotti. 2008. “Drunk Driving after the Passage of Smoking Bans in Bars.” Journal of Public Economics 92 (5–6), 1288–1305.

Agarwal, Sumit, Richard K. Green, Eric Rosenblatt, Vincent W. Yao, and Jian Zhang. 2015 "Who Bears the Pen? Relative Income and Gender Gap in Mortgage Signing Order." SSRN.

Autor, David H., John J. Donohue III, and Stewart J. Schwab. 2006. “The Costs of Wrongful-Discharge Laws.” Review of Economics and Statistics 88 (2), 211–231.

Badgett, M. V. 2009. "The Economic Value of Marriage for Same-Sex Couples." Drake L. Rev. 58, 1081-1115.

Becker, Gary S. 1981. "A Treatise on the Family." Cambridge, MA.

Bhutta, Neil and Glenn B. Canner. 2013. “Mortgage Market Conditions and Borrower Outcomes: Evidence from the 2012 HMDA Data and Matched HMDA-Credit Record Data.” Federal Reserve Bulletin 99 (4).

Black, Dan, Gary Gates, Seth Sanders, and Lowell Taylor. 2002. "Why do gay men live in San Francisco?." Journal of Urban Economics 51(1), 54-76.

Blau, Francine D., and Lawrence M. Kahn. 2006. "The US gender pay gap in the 1990s: Slowing convergence." Industrial & Labor Relations Review 60(1), 45-66.

Dedman, Bill. May 1, 1988. “Atlanta blacks losing in home loans scramble.” Atlanta Journal-Constitution.

Dietz, Robert D., and Donald R. Haurin. 2003. "The social and private micro-level consequences of homeownership." Journal of urban Economics 54(3), 401-450.

Farmer, Amy, and Andrew W. Horowitz. 2015. "Same-sex relationship escalation with uncertain marriage legality: Theory and empirical implications." Southern Economic Journal 81(4), 995-1011.

Carpenter, Christopher, and Gary J. Gates. 2008. "Gay and lesbian partnership: Evidence from California." Demography 45(3), 573-590.

Granziera, Eleonora and Sharon Kozicki. 2002. “House price dynamics: Fundamentals and expectations.” Bank of Canada Working Paper 2012-12.

Grossbard, Shoshana, and Lisa K. Jepsen. 2008. "The economics of gay and lesbian couples: Introduction to a special issue on gay and lesbian households." Review of Economics of the Household 6(4), 311-325.

Hoyt, William H., and Stuart S. Rosenthal. 1990. "Capital gains taxation and the demand for owner-occupied housing." The Review of Economics and Statistics 72(1), 45-54.

Ioannides, Yannis M., and Stuart S. Rosenthal. 1994. "Estimating the consumption and investment demands for housing and their effect on housing tenure status." The Review of Economics and Statistics 76(1), 127-141.

Jepsen, Lisa K., and Christopher A. Jepsen. 2002. "An empirical analysis of the matching patterns of same-sex and opposite-sex couples." Demography 39(3), 435-453.

Kolko, Jed. August 19, 2012. “Welcome to the Gayborhood.” HuffingtonPost.

Leppel, Karen. 2007A. "Home-ownership among opposite-and same-sex couples in the US." Feminist Economics 13(1), 1-30.

Leppel, Karen. 2007B. "Married and unmarried, opposite-and same-sex couples: A decomposition of homeownership differences." Journal of Housing Research 16(1), 61-81.

Lofquist, Daphne. September 2011. “Same-Sex Households.” American Community Survey Briefs.

Mayer, Chritopher and Todd Sinai. September 27, 2007. “Housing and behavioral finance.” Prepared for the Federal Reserve Bank of Boston’s “Implications of Behavioral Economics on Economic Policy” conference.

Meyer, Breed D. 1995. “Natural and Quasi-Experiments in Economics.” Journal of Business & Economic Statistics 13 (2), 151–161.

Munnell, Alicia H., Geoffrey M. B. Tootell, Lynn E. Browne, and James McEneaney. 1996. “Mortgage Lending in Boston: Interpreting HMDA Data.” American Economic Review 18(1), 25-53.

Office, General Accounting. January 2004. "Defense of Marriage Act: Update to Prior Report." Letter to Senate Majority Leader Bill Frist (R-TN). Washington, DC.

Oreffice, Sonia. 2011. "Sexual orientation and household decision making: Same-sex couples' balance of power and labor supply choices." Labour Economics 18(2), 145-158.

Paciorek, Andrew. 2013. “The long and the short of household formation.” Working Paper 2013-26. Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board.

Rosen, Harvey S., and Kenneth T. Rosen. 1980. "Federal taxes and homeownership: Evidence from time series." The Journal of Political Economy 88(1), 59-75.

Stevenson, Betsey. 2007. "The Impact of Divorce Laws on Marriage-Specific Capital." Journal of Labor Economics 25(1), 75-94.

U.S. Department of Housing and Urban Development. 2011. “A look at the FHA’s evolving market shares by race and ethnicity.” U.S. Housing Market Conditions.

Waite, Linda J., and Evelyn L. Lehrer. 2003. "The benefits from marriage and religion in the United States: A comparative analysis." Population and Development Review 29(2), 255-275.