Credit Competition and the Transition to Home Ownership

Zhenguo Lin
Hollo School of Real Estate
College of Business
Florida International University
Miami, FL 33199
zlin@fiu.edu

Yingchun Liu
Department of Finance, Insurance, Real Estate and Law
College of Business
University of North Texas
Denton, TX 76203
yingchun.liu@unt.edu

Jia Xie
Department of Real Estate Management
Ted Rogers School of Business Management
Ryerson University
Toronto, Ontario, Canada M5B 2K3
jia.xie@ryerson.ca

Abstract

Since 1970s, most states in the U.S. removed restrictions on intra-state branching and inter-state banking, which intensified bank competition and increased credit supply. We assess whether renters are more likely to become home owners after banking deregulations. By exploiting the cross-state variation in the timing of intra-state and inter-state banking deregulations over a 10-year period, we find that credit competition induced by the removal of the barriers to branching within state and to out-of-state bank entry from banking deregulation, explains as high as 25.7% increase in the transition probability from renters to homeowners. Our results are robust to potential sample-selection bias and functional misspecifications.

December 8, 2016

Credit Competition and the Transition to Home Ownership

[Abstract] *Since 1970s, most states in the U.S. removed restrictions on intra-state branching and inter-state banking, which intensified bank competition and increased credit supply. We assess whether renters are more likely to become home owners after banking deregulations. By exploiting the cross-state variation in the timing of intra-state and inter-state banking deregulations over a 10-year period, we find that credit competition induced by the removal of the barriers to branching within state and to out-of-state bank entry from banking deregulation, explains as high as 25.7% increase in the transition probability from renters to homeowners. Our results are robust to potential sample-selection bias and functional misspecifications.*

1.   Introduction

For decades, home ownership has been an essential element of the American Dream. Consequently, U.S. presidents have been promoting home ownership since 1934, when the Federal Housing Administration was created by Franklin D. Roosevelt to insure mortgages in part so low income borrowers could qualify. Through the passing years, administrations touted home owning as a way to put middle and low income families on a path to social and financial stability by promoting a more involved citizenry. Successive Clinton and Bush administrations unleashed ambitious programs to promote home ownership, especially for low income households. President Clinton's "National Homeownership Strategy" in 1995 set a goal of allowing millions of families to own homes, in part, by making financing "more available, affordable, and flexible." President George W. Bush famously said in 2002 that "We can put light where there's darkness, and hope where there's despondency in this country. And part of it is working together as a nation to encourage folks to own their own home," and in a 2004 speech he said again that "We're creating... an ownership society in this country, where more Americans than ever will be able to open up their door where they live and say, welcome to my house,

welcome to my piece of property."[1]

The question of what determines home ownership has been extensively researched in the literature. The determinants of home ownership include: demographic and socioeconomic characteristics of households (Eilbott and Binkowski, 1985; and Gyourko and Linneman, 1996), race of the households (Kain and Quigley, 1972; Yinger, 1995; and Munnell et al. 1996), household income and wealth (Gyourko et al. 1999; Charles and Hurst, 2002; and Hilber and Liu, 2008), tax-shelter effect (Charles and Hurst, 2002), and immigration factor (Coulson, 1999).

We add to this line of research by studying the effect of increasing credit supply on home ownership. Exogenous shift in credit supply is brought by changes in banking regulations. Most states in the U.S. removed restrictions on intra-state branching and inter-state banking during 1980s-1990s. Banking deregulations intensified bank competition and increased credit supply, which likely affected economic performance. Strahan (2003) present empirical evidence that banking deregulation led to substantial and beneficial real effects on the economy. Many other studies examine how the banking deregulations affect corporate innovation (e.g. Amore, Schneider and Zaldokas, 2013), personal bankruptcy (e.g. Dick and Lehnert, 2010), market structure of nonfinancial sectors (e.g. Cetorelli and Strahan, 2006), and entrepreneurship (e.g. Black and Strahan, 2002).

The two papers that are closest to this study are Favara and Imbs (2015) and Vigdor (2006). Favara and Imbs (2015) study the impact of US banking deregulation on home prices. They find that credit expansion induced by deregulation increases both housing demand and house prices. However, Favara and Imbs (2015) did not look at the impact of the banking deregulations on home ownership. Vigdor (2006) examines the impact of credit supply on both home price and home ownership, by using another instrument of credit supply – mortgage

---

[1] There are many benefits of owning a home. Research finds that owning a home is an important mechanism for wealth creation (e.g. Herbert, McCue, and Sanchez-Moyano, 2013), and it also brings many social benefits for families, communities, and the country as a whole (e, g. Green and White, 1997; and Glaeser and Sacerdote, 1999). Coulson (2002) provides an excellent review on the social benefits of homeownership and some related questions.

product innovations. He finds that although recent mortgage innovations increased mortgage

credits to the housing market, but they served primarily to increase house prices rather than home

ownership. This finding suggests that increasing credit supply may not necessarily increase home

ownership. A possible explanation could be that, when credit supply increases, households enjoy

easy access to mortgage credits or lower mortgage rates; but they also find that saving is not

necessary for rainy days because borrowing money is easy from the bank if they have

unexpected cash needs. This leads the households to overspend when credit supply increases. As

a result, increasing credit supply may not result in home ownership increase. In other words, as a

prior, it is unclear whether banking deregulations increase home ownership. In this paper, we

study the impact of banking deregulations on the transition probability from renters to

homeowners. In particular, we follow a sample of renters in the Panel Study of Income

Dynamics (PSID) data in 1984 and 1989, separate them into two groups: one group of renters

experienced bank deregulations in the next 5 years, while the other group did not, and analyze

differences in the likelihood of becoming homeowners in the next 5 years between these two

groups.[2] We find that after controlling for observables, including household demographic and

socio-economic characteristics, housing market related variables, and state and year fixed effects,

the effects of increasing credit supply measured by both intra-state and inter-state banking

deregulations are economically important and statistically significant. In particular, renters who

experienced both inter-state and intra-state banking deregulations are 6.8 percentage points more

likely to become homeowners than other renters, all else being equal. Given that the

unconditional transition rate from renters to owners is 26.5 percent, the 6.8 percentage points

---

[2] We use the 1984, 1989 and 1994 waves of the survey data, because bank deregulations remained static before 1970s and began to change from 1970s to early 1990s, and completed by 1994 with the passage of Riegle-Neal Interstate Banking and Branching Efficiently Act (IBBEA). Numerous studies also limit their data sample to the mid-1990s, such as Amore, Schneider and Zaldokas (2013), Dick and Lehnert (2010), Cetorelli and Strahan (2006), Black and Strahan (2002), and Kroszner and Strahan (1999). However, Chu (2015), Favara and Imbs (2015), and Rice and Strahan (2010) consider banking deregulation to begin with the enaction of the law, but due to roadblocks created by states, did not complete until 2005.

increase in home ownership is economically important. In other words, banking deregulations, by removing the barriers to branching within state and to out-of-state bank entry, can explain as high as a 25.7% increase in the transition probability from renters to homeowners.[3] Our results are robust to potential sample-selection bias and functional misspecifications.

There are several channels through which banking deregulations may affect the transition of renters to homeowners. We first look at the income channel. Banking deregulations boost household income, especially those in the lower part of the income distribution, making home ownership more affordable for these households. Consistent with the existing literature (e.g. Beck, Levine and Levkov, 2010), we find that banking deregulations have a positive impact on household income, and the impact is larger for households in the lower part of income distribution. The second is through technology channel. Dick and Lehnert (2010) suggest that banking deregulations improve financial technology innovation, which further improves lenders' ability to more accurately price for credit risk and therefore offer credit to higher-risk households. If this is indeed the case, the impact of bank deregulation should be larger for higher-risk renters. In fact, we find such evidence.

In September 2016, the S&P Case-Shiller home price index set a new record high, surpassing the previous high from July 2006. If you are a homeowner, you will enjoy an ongoing boost in wealth from home price appreciation. However, the homeownership rate has been dropping since 2004 when it reached the peak of 69.2%. It is now just 63.5% at levels of the mid-1960s.[4] In other words, home prices set a new record, but fewer home owners benefited.

The findings of this paper have important policy implications, especially given a large drop in home ownership rate since the 2007-2009 housing crisis. It suggests that the worsening

---

[3] 25.7% is obtained by calculating the ratio of 6.8 percent to 26.5 percent, i.e., 6.8%/26.5%=25.7%.
[4] After the 2007-2009 housing crisis, the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) brings comprehensive reform to the regulation of swaps and derivatives, which has a profound impact on the secondary mortgage market. From the lending side, stricter lending criteria are enforced to eliminate high-risk loans and reduce default risk, and many pre-crisis borrowers are no longer eligible for loans.

credit market condition during the crisis has played an important role in the big drop of recent homeownership rates. The findings also suggest that government policy aiming to increase credit supply will have a significant effect on improving the home ownership rate. There is an on-going debate whether the Dodd-Frank Act should be dismantled. With the economy continuing to heal and the US unemployment rate dropping to 4.6% in November 2016 - the lowest level since August 2007, to dismantle the Dodd-Frank Act will certainly help more American families to fulfill their dreams.

The rest of the paper proceeds as follows. In the next section, we describe our data and present some summary statistics. In Section 3, we present our empirical results on effect of the banking deregulation on home ownership. Section 4 conducts a robustness check. The last section provides some concluding remarks and discussions.

2.   Data

This section introduces the data. It first describes the nature of the changes to banking deregulation in the United States since 1970s. The Panel Study of Income Dynamics (PSID) data used in the study is discussed next.

2.1.   Banking Deregulation

Banking is a highly regulated industry. The geographic expansion of banking has been restricted by Mcfadden Act of 1927 and later the Douglas Amendment to the Banking Holding Company Act of 1956. Over the 1970s to early 1990s, U.S. states gradually removed the restrictions on the expansion of banking activities within and across the states. States normally deregulate intra-state banking and then move to deregulate inter-state banking. Intra-state deregulation allows banks to expand within states, and inter-state deregulation allows banks to expand beyond state boundaries. The deregulatory process was completed with passage of the

5

Interstate Banking and Branching Efficiency Act of 1994 (IBBEA). Federal legislation mandated complete interstate banking as of 1997.

Following Jayaratne and Strahan (1996), we choose the date of deregulation as the date on which a state permitted branching via mergers and acquisitions (M&A) through the holding company. This is the first step in the deregulation process, followed by removing other restrictions. Most banks enter new markets by buying existing banks or branches. Table 1 has the years each state deregulated on intrastate branching and interstate banking. By 1980, about a third of states have deregulated the intrastate branching; only state of Maine has removed restrictions on interstate banking. The deregulation process was completed in 1997 as mandated by the Riegle-Neal Interstate Banking and Branching Efficient ACT of 1994. We have the data for 50 states and the District of Columbia. Consistent with the literature on branching deregulation (e.g., Black and Strahan, 2002, Dick and Lehnert, 2010), we remove Delaware and South Dakota because the structure of their banking systems was heavily affected by laws that made them centers for the credit card industry.

The deregulation of intrastate branching and interstate banking increases the potential entry of new bank and reduces the market power of incumbents. In fact, for an average state, the fraction of assets held by out of state bank holding companies rose from 0% in mid-1970 to 23% in mid-1990 (Kerr and Nanda, 2010). The deregulations of banks have increased banks' efficiency, benefited the real economy and improved the geographic diversification (Jayaratne and Strahan, 1998, Strahan, 2003 and Goetz, Laeven, and Levine, 2013). In addition, Dick and Lehnert (2010) shows that out-of-state banks adopt more sophisticated monitoring and screening technologies than local banks, further reduce the cost of credit supply.

Table 1: Year of Bank Deregulation in Each State

State	Year of inter-state deregulation	Year of intra-state deregulation	State	Year of inter-state deregulation	Year of intra-state deregulation
AK	1982	1960	MT	1993	1990
AL	1987	1981	NC	1985	1960
AR	1989	1994	ND	1991	1987
AZ	1986	1960	NE	1990	1985
CA	1987	1960	NH	1987	1987
CO	1988	1991	NJ	1986	1977
CT	1983	1980	NM	1989	1991
DC	1985	1960	NV	1985	1960
DE	1988	1960	NY	1982	1976
FL	1985	1988	OH	1985	1979
GA	1985	1983	OK	1987	1988
HI	1995	1986	OR	1986	1985
IA	1991	1999	PA	1986	1982
ID	1985	1960	RI	1984	1960
IL	1986	1988	SC	1986	1960
IN	1986	1989	SD	1988	1960
KS	1992	1987	TN	1985	1985
KY	1984	1990	TX	1987	1988
LA	1987	1988	UT	1984	1981
MA	1983	1984	VA	1985	1978
MD	1985	1960	VT	1988	1970
ME	1980	1975	WA	1987	1985
MI	1986	1987	WI	1987	1990
MN	1986	1993	WV	1988	1987
MO	1986	1990	WY	1987	1988
MS	1988	1986			

2.2. The PSID dataset

The PSID dataset is a longitudinal household survey started in 1968 with a sample of over 18,000 individuals living in over 5,000 families in the United States. Individuals in each household were followed annually from 1968 to 1997, and biannually after 1997. The PSID data set is unique for the current study in several respects. First, the data set contains detailed household demographic information (i.e., age, gender, race, marital status and geographic location) and socioeconomic characteristics (i.e., education, employment status, income, and wealth). Second, each household is assigned a unique identification number, by which we can follow each household over time. Finally, the data set is nationally representative.

We use the 1984, 1989 and 1994 waves of the survey data, because bank deregulations remained static before 1970s and began to change from 1970s to early 1990s with the passage of IBBEA in 1994. The household wealth information is only available in 1984, 1989 and 1994 and then biannually since 1999. We focus on a sample of renters in 1984 and 1989, classify them into two groups: one group of renters experienced bank deregulations in the next 5 years, while the other group did not, and analyze differences in the likelihood of becoming home owners in the next 5 years between these two groups of renters.

There are two types of banking deregulations: intra-state and inter-state. We drop households who moved across states during the sample period, to eliminate the impact from change of states. The other control variables include household demographic and socioeconomic characteristics, house prices, whether the state is a recourse state, etc. After omitting observations with missing values, the final data contain 4,060 renters in 1984 or 1989. Table 2 provides summary statistics for these groups of households.

The preliminary results from Table 2 reveal two interesting observations that motivate us to examine the issues further. First, we find that, unconditionally, renters residing in the states that experienced either intra- or inter-state deregulation are more likely to become homeowners in the next five years. However, they tend to have higher unemployment rate, lower family income and wealth with less education. Second, renters who become homeowners in the next five years tend to be employed, healthier, have higher income and wealth, and more likely to reside in states with lower median house prices. The systematic differences in these observables highlight the importance of controls in the analysis we conduct.

Table 2: Summary Statistics

	Intra-state deregulations		Inter-state deregulations		Become home owners in the next 5 years	
	No	Yes	No	Yes	No	Yes
Share of renters becoming homeowners in the next 5 years	26.3%	32.5%	27.0%	28.4%	N/A	N/A
Age	40.40	39.59	40.66	39.57	42.12	35.31
Race						
White	0.75	0.75	0.76	0.73	0.71	0.85
Black	0.23	0.23	0.22	0.23	0.27	0.13
Other	0.02	0.02	0.02	0.04	0.03	0.02
Female	0.43	0.42	0.42	0.44	0.51	0.21
Married	0.28	0.29	0.27	0.30	0.22	0.44
Children	0.62	0.65	0.58	0.70	0.61	0.66
Education (yrs)	12.28	11.92	12.42	11.88	11.94	12.94
Health						
Very good	0.23	0.24	0.23	0.24	0.20	0.32
Good	0.31	0.30	0.32	0.29	0.29	0.37
Fair	0.27	0.24	0.25	0.28	0.28	0.23
Bad	0.14	0.16	0.15	0.13	0.17	0.06
Very bad	0.05	0.05	0.05	0.07	0.07	0.02
Unemployed	0.06	0.08	0.05	0.08	0.08	0.03
Family income ($)	21,671	16,701	22,615	17,589	18,266	27,117
Wealth (excluding home, $)	21,510	15,650	23,011	16,065	19,183	23,493
State median house price ($)	83,679	60,666	88,266	64,432	80,409	76,038
Recourse	0.75	0.85	0.80	0.72	0.77	0.75
Number of observations	3224	836	2212	1848	3039	1021

Note: data is weighted using PSID core sample weights, and state median house price is from Federal Housing Finance Agency.

3. Main Empirical Findings

We use the pooled logit model to study the impact of bank deregulations on the probability of a renter becoming a homeowner. The results, however, are robust to various estimation methods, as we will show later. The structure of the pooled logit model has the latent variable format:

$$Y_{i,t}^{*} = \alpha\, intra_{i,t} + \beta\, inter_{i,t} + \gamma\, X_{i,t} + \varepsilon_{i,t} \,, \tag{1}$$

$$Y_{i,t} = \begin{cases} 1 & if \quad Y_{i,t}^{*} > 0 \\ 0 & otherwise \end{cases}, \tag{2}$$

The first equation is the latent variable equation, where $Y_{i,t}^*$ is a latent variable that can be written as a linear function of the regressors. The second equation is the choice equation, where $Y_{i,t}$ is an indicator variable of becoming home owners, which equals 1 if Renter i in Year t becomes a homeowner in the next 5 years, and zero otherwise. $intra_{i,t}$ is the indicator variable of intra-state deregulation, which equals 1 if Renter i in Year t lives in a state that experienced intra-state deregulation in the next 5 years, and 0 otherwise. Similarly, $inter_{i,t}$ is the indicator variable of inter-state deregulation, which equals 1 if Renter i in Year t lives in a state that experienced inter-state deregulation in the next 5 years, and 0 otherwise. $X_{i,t}$ is a vector of other regressors, including household demographic and socio-economic characteristics, housing market related factors, etc. $\varepsilon_{i,t}$ is the error term.

We estimate a series of different specifications by gradually increasing the number of controlled variables in $X_{i,t}$ to see their effects on the probability of renters becoming homeowners. The estimated coefficients, standard errors, marginal effects and significance levels are reported in Table 3.

We begin with the simplest specification by controlling for $intra_{i,t}$ and $inter_{i,t}$ only, and we report the results in Column (1) of Table 3. The marginal effect indicates that, without controlling for any observables, renters in the states that experienced intra-state deregulation on average are 5.9 percentage points more likely to become homeowners, and the difference is statistically significant at the 1% level. For inter-state deregulation, the effect (0.1%) is negligible and statistically insignificant.

As a first step toward measuring the effect of banking deregulation on home ownership, in Specification 2 we control for demographic and socio-economic variables including age, gender, race, marital status, education, number of children, change in the number of children,

employment status, income and wealth. In addition, we have learned from Table 2 that renters

who become homeowners in the next five years tend to be healthier, so we also control for

renter's health status in Specification 2.[5] The results are reported in Column (2) of Table 3. Now

the effects of both intra-state and inter-state deregulations become statistically significant.

In Specification 3, we further control for housing market related factors such as house

price, mortgage rate, as well as whether the state is a recourse state. In a recourse state, if a

borrower defaults on the mortgage and the house is sold by the lender in a public auction (i.e.,

the foreclosure auction), lender can go after the other personal assets of the borrower if the

proceed from the foreclosure auction is not enough to cover the lender's loss from the sale.

Therefore, other things equal, recourse states should have a lower home ownership transition rate

than non-recourse states. The results are reported in Column (3) of Table 3. The estimated

marginal effects suggest that renters in states that experienced intra-state (or inter-state)

deregulation on average are about 4.5 (4.4) percentage points more likely to become

homeowners, and the difference is statistically significant at the 1 percent level.

In Specification 4, we further control for the state and year fixed effects and report the

findings in Column (4) of Table 3. The results suggest that renters who live in the states which

experienced both inter-state and intra-state banking deregulations are 6.8 percentage points more

likely to become homeowners (4.9 percentage points from the inter-state deregulation and 1.9

percentage points from the intra-state deregulation). Given that the unconditional transition rate

from renters to owners is about 26.5 percent, the 6.8 percentage points increase is economically

important, which can explain as high as a 25.7% increase in the transition probability from

renters to homeowners.

---

[5] Initially we also control for marginal tax rate in Specification 2, but it turns out to be statistically insignificant.
Charles and Hurst (2002) have a similar finding: marginal tax rate is significant when only controlling for race, age,
education, marital status, and number of children. However, it becomes statistically insignificant after controlling for
income, wealth and employment status.

Table 3: Impact of Bank Deregulations on the Probability of Renters Becoming Home Owners
(Pooled logit regressions)

	(1)			(2)			(3)			(4)		
	Marginal effect	Coef.	Significance level	Marginal effect	Coef.	Significance level	Marginal effect	Coef.	Significance level	Marginal effect	Coef.	Significance level
Intra-state deregulation	0.059	0.298 (0.023)	***	0.069	0.416 (0.026)	***	0.045	0.277 (0.026)	***	0.019	0.120 (0.029)	***
Inter-state deregulation	0.001	0.003 (0.019)		0.012	0.070 (0.022)	***	0.044	0.272 (0.034)	***	0.049	0.306 (0.036)	***
Demographic and Socioeconomic Status												
Age				0.007	0.044 (0.004)	***	0.007	0.041 (0.004)	***	0.008	0.047 (0.004)	***
Age squared				-0.0001	-0.001 (0.000)	***	-0.0001	-0.001 (0.000)	***	-0.0001	-0.001 (0.000)	***
Race (white is omitted)												
Black				-0.082	-0.494 (0.029)	***	-0.073	-0.449 (0.029)	***	-0.083	-0.514 (0.031)	***
Other				-0.124	-0.745 (0.069)	***	-0.084	-0.511 (0.070)	***	-0.080	-0.497 (0.070)	***
Female				-0.110	-0.665 (0.027)	***	-0.108	-0.658 (0.027)	***	-0.101	-0.628 (0.027)	***
Married				0.060	0.361 (0.028)	***	0.058	0.356 (0.028)	***	0.062	0.386 (0.028)	***
# of Children				0.022	0.135 (0.013)	***	0.017	0.104 (0.013)	***	0.018	0.114 (0.013)	***
Change in # of children				0.066	0.397 (0.014)	***	0.064	0.388 (0.014)	***	0.065	0.404 (0.014)	***
Education (less than high school is omitted)												
High school degree				0.023	0.136 (0.029)	***	0.023	0.139 (0.029)	***	0.023	0.145 (0.029)	***
College degree				0.057	0.344 (0.030)	***	0.060	0.368 (0.030)	***	0.059	0.368 (0.031)	***
Health status (very good is omitted)												
Good				-0.023	-0.140 (0.025)	***	-0.024	-0.147 (0.026)	***	-0.025	-0.157 (0.026)	***
Fair				-0.052	-0.313 (0.028)	***	-0.051	-0.313 (0.029)	***	-0.051	-0.316 (0.029)	***
Bad				-0.120	-0.724 (0.042)	***	-0.118	-0.719 (0.042)	***	-0.113	-0.705 (0.042)	***
Very bad				-0.108	-0.649 (0.067)	***	-0.102	-0.624 (0.068)	***	-0.089	-0.553 (0.068)	***
Unemployed				-0.107	-0.646 (0.050)	***	-0.106	-0.646 (0.050)	***	-0.113	-0.704 (0.051)	***
Log(family income)				0.023	0.140 (0.013)	***	0.030	0.183 (0.013)	***	0.031	0.190 (0.013)	***
Quartile of wealth (1st quartile is omitted)												
2nd quartile				0.034	0.204 (0.028)	***	0.032	0.195 (0.028)	***	0.028	0.172 (0.029)	***
3rd quartile				0.107	0.646 (0.030)	***	0.112	0.685 (0.030)	***	0.111	0.692 (0.031)	***
4th quartile				0.097	0.583 (0.036)	***	0.096	0.589 (0.037)	***	0.100	0.623 (0.037)	***
Housing market conditions												
Log(state median house price)							-0.137	-0.839 (0.037)	***	-0.086	-0.533 (0.053)	***
Mortgage rate							-2.303	-14.081 (0.945)	***	-1.843	-11.453 (1.001)	***
Recourse							-0.018	-0.109 (0.025)	***	-0.056	-0.346 (0.036)	***
Year and state fixed effects	No			No			No			Yes		
Log likelihood	-35990			-30658			-30349			-29905		
Number of observations	4060			4060			4060			4060		

3.1. The Random Effect and Fixed Effect Logit Models

Given that the PSID is longitudinal data, more empirical tools are available that can improve the efficiency of our estimation of the impact of banking deregulations. For example, one concern of the pooled logit model is that the latent variable equation (1) may be

$$Y_{i,t}^* = \alpha\, intra_{i,t} + \beta \operatorname{int} er_{i,t} + \gamma\, X_{i,t} + U_i + \varepsilon_{i,t}, \qquad (3)$$

where U_i includes all unobservables that are constant over time, such as risk aversion of the household. If this is the case, our previous results from the pooled logit regressions may be inefficient or biased (due to unobservables). To mitigate this concern, we use both the random effect and the fixed effect models to re-estimate the coefficients. In theory, if U_i is uncorrelated with $\varepsilon_{i,t}$, both the random effect and the fixed effect models are consistent, but the random effect model is more efficient. On the other hand, if U_i is correlated with $\varepsilon_{i,t}$, then only the fixed effect model is consistent.

After accounting for unobserved heterogeneity of households, key results from the random effect and the fixed effect logit estimations are reported in Table 4. Consistent with our pooled logit regression, inter-state bank deregulation has a larger impact than intra-state deregulation on the transition probability from renters to homeowners: the transition rate increases by 3.4~3.5 percentage points after intra-state deregulation (compared to 1.9 percentage points from the pooled logit model), and by 4.2~5.1 percentage points after inter-state deregulation (compared to 4.9 percentage points from the pooled logit model). The other covariates in the random effect and the fixed effects logit estimations are the same as in Column (4) of Table 3; that is, we have controlled for household demographic and socioeconomic characteristics, housing market related factors, and year and state fixed effects. In sum, the random effect and fixed effect estimations confirm our main results.

**Table 4: Impact of Bank Deregulations on the Probability of Renters Becoming Home Owners
(Random effect and fixed effect logit regressions)**

	(1) Random effect			(2) Fixed effect		
	Marginal effect	Coef.	Significance level	Marginal effect	Coef.	Significance level
Intra-state deregulation	0.034	0.271	***	0.035	0.361	***
		(0.044)			(0.039)	
Inter-state deregulation	0.051	0.408	***	0.042	0.428	***
		(0.054)			(0.031)	
Other controls						
Demographic and socioeconomic Status	Yes			Yes		
Housing market conditions	Yes			Yes		
Year and state fixed effects	Yes			Yes		
Log likelihood	-28847			-4876.9		
Number of observations	4060			4060		

3.2.   Channels

A number of theories can, in principle, produce the basic pattern of results that we observe in the data. In this subsection, we attempt to distinguish between these potential theories or channels. There are at least two possible reasons why renters are more likely to become homeowners after banking deregulations. The first is the income channel. Strahan (2003) and Beck, Levine and Levkov (2010) have found that banking deregulation increases household income, especially for the low income households. With increased income, homes become more affordable for renters in the lower part of the income distribution, and therefore the transition rate increases. The second channel is through the advances in credit risk pricing technology, especially the development of credit scoring technology. Bank deregulation increases competition among banks, and improves financial technology innovation. Technology innovation improves lenders' ability to more accurately price for credit risk and therefore offer credit to higher-risk individuals. Next we examine these two explanations in more detail.

14

3.2.1. The Income Channel

Strahan (2003) has provided strong evidence that bank deregulation has beneficial real effect on the economy, one component of which is household income. In addition, Beck, Levine and Levkov (2010) have also shown that bank deregulation boosts income for households with income below the median. If an increase in household income increases the probability of renters becoming home owners, the impact of bank deregulations on the transition rate works in part through the income channel. We have learned from Table 3 that income indeed has a positive impact on the transition rate from renters to owner. Therefore, to find evidence of the income channel, we are left to find out if bank deregulations have a positive impact on household income, especially for households in the lower part of the income distribution. To this end, we run a regression of the natural logarithm of the family income on the indicator variables of intra- and inter-bank deregulations and other observables, such as household demographic and socioeconomic status, and state and year fixed effects. The results are reported in Column (1) of Table 5. Consistent with previous literature, we find that the average household income increases by 21.9 percent after inter-state banking deregulation. Intra-state banking deregulation, however, has no significant impact on the average household income. In addition, to find out if the impact of inter-state deregulation is larger for low income households we run three quantile regressions for the 25th, 50th and 75th percentile of the income distribution, respectively, and report the results in Columns (2) to (4) of Table 5. We omit the intra-state regulation in these quantile regressions. Indeed, the impact of inter-state banking deregulation on income is not uniform: the impact is largest on the 25th percentile of the income distribution (20.3 percent and significant at the 1 percent level), drops by half on the 50th percentile of the income distribution (10.9 percent and significant at the 10 percent level), and is economically negligible and statistically insignificant on the 75th percentile of the income distribution. In sum, we find evidence that inter-state

banking deregulation impacts the transition rate of renter to owners through the income channel, especially among renters in the lower part of the income distribution.

	(1)		(2)		(3)		(4)	
Table 5: Impact of Bank Deregulations on Household Income								
	OLS		Quantile regressions					
			25th percentile		50th percentile		75th percentile	
	Coef.	Significance level	Coef.	Significance level	Coef.	Significance level	Coef.	Significance level
Intra-state deregulation	0.021		N/A		N/A		N/A	
	(0.037)							
Inter-state deregulation	0.219	***	0.203	***	0.109	*	0.013	
	(0.067)		(0.075)		(0.067)		(0.065)	
Other controls								
Demographic and socioeconomic Status	Yes		Yes		Yes		Yes	
Year and state fixed effects	Yes		Yes		Yes		Yes	
Number of observations	9335		9335		9335		9335	

3.2.2. The Technology Channel

Another potential reason why renters are more likely to become owners after banking deregulations is because banking deregulations intensify competition among banks, and improves financial technology innovation. Technology innovation improves lenders' ability to more accurately price for credit risk and therefore offer mortgage credits to higher-risk households. If this is the case, the impact of bank deregulation should be larger for higher-risk renters. To test for this hypothesis, we define higher-risk renters as those with debt-to-income ratios larger than 20 percent. The debt-to-income ratio does not include mortgages, as renters do not have mortgages. We then re-run our main regressions (i.e., the specification in Column 4 of Table 3) and control for the interactions of the indication variables of banking deregulations and the indication variable of high-risk renters. The results are reported in Table 6. Indeed, we find that both intra- and inter-state deregulations have larger impacts on higher-risk renters: The

16

impact of intra-state deregulation on the transition rate of renters to owners is 1.3 percentage

points for lower-risk renters, but almost tripled (3.7 percentage points) for higher-risk renters.

Similarly, the impact of inter-state deregulation is 4.7 percentage points for lower-risk renters,

but more than doubled for higher-risk renters (10.9 percentage points). These results provide

strong evidence that the impact of bank deregulations (both intra- and inter-state) is in part

through the technology channel, so that higher-risk renters benefit more from bank competition

after the deregulations.

Table 6: Impact of Bank Deregulations on the Probability of Renters Becoming Home Owners
(Lower-risk vs higher-risk renters)

	Marginal effect	Coef.	Significance level
Lower-risk renters (with debt-to-income ratios ≤ 20%)			
Intra-state deregulation	0.013	0.079	**
		(0.031)	
Inter-state deregulation	0.047	0.292	***
		(0.038)	
Higher-risk renters (with debt-to-income ratios > 20%)			
Intra-state deregulation	0.037	0.234	***
		(0.069)	
Inter-state deregulation	0.109	0.680	***
		(0.066)	
Other controls			
Demographic and socioeconomic Status		Yes	
Year and state fixed effects		Yes	
Log likelihood		-29805	
Number of observations		4060	

4.   Robustness Check

In this section, we study three potential problems with the estimations we have had so far: (1) endogeneity of bank deregulation, (2) sample selection bias, and (3) model misspecifications.

4.1.   Endogeneity of Bank Deregulation

Bank deregulation is an endogenous decision affected by many state-level factors. For instance, deregulation may occur earlier in states (i) with fewer small banks, (ii) where small banks were financially weak, and (iii) with more small and bank-dependent firms (Kroszner and Strahan, 1999). To the extent that the state-level unobservables affect states' decisions on bank deregulations and households' decisions to buy homes, our estimates may be biased due to endogeneity of bank deregulation. However, our results are unlikely affected by this potential endogeneity for the following reason: Since we have controlled for the state fixed effects, we are comparing the probability of renter becoming homeowners before and after a given state experienced bank deregulation, instead of a cross-sectional comparison between states. All of the impact from cross-sectional variation should be removed by the state fixed effects. That is, any persistent differences across states (such as the number of small banks and the financial condition of small banks) do not affect our results.

4.2.   Sample Selection Bias

The outcome variable – whether a household becomes a homeowner – is only observable for renters. If the subsample of renters is not a random sample of the entire population of American households, our previous estimators are likely to suffer from sample selection bias. Indeed, in our data (see Table 7), renters tend to be young, single, unemployed, and have lower income, lower wealth and worse health conditions. To correct this potential bias, we implement the Heckman logit model, also known as the bivariate logit model with sample selection. The

18

Heckman logit model uses the full sample of households, including both renters and homeowners.

The Heckman logit model is estimated using the maximum likelihood method. Assume that y_1 is the indicator variable of renters, and X_1 is the set of covariates that affect y_1. Also assume that y_2 is the indicator variable of those renters who become homeowners, and X_2 is the set of covariates that affect y_2. There are three types of observations in our sample, with the following probabilities:

$$
\begin{aligned}
y_1 &= 0 & \text{Prob}(y_1 = 0) &= F(-\beta_1 X_1), \\
y_1 &= 1, y_2 = 1 & \text{Prob}(y_1 = 1, y_2 = 1) &= F_2(\beta_1 X_1, \beta_2 X_2, \rho), \\
y_1 &= 1, y_2 = 0 & \text{Prob}(y_1 = 1, y_2 = 0) &= F(\beta_1 X_1) - F_2(\beta_1 X_1, \beta_2 X_2, \rho),
\end{aligned}
$$

where F is the standard logistic distribution and F_2 is the bivariate logistic distribution defined as follows:

$$
F_2(y_1, y_2, \rho) = \frac{1}{1 + (e^{-y_1/\rho} + e^{-y_2/\rho})^\rho},
$$

where ρ denoting the correlation coefficient between the two standard logistic distributions (Dubin and Rivers, 1989). The maximum-likelihood method finds values of β_1, β_2 and ρ to maximize the following joint-likelihood function:

$$
\ln(L(\beta_1, \beta_2, \rho)) = \sum_{i=1}^{n} \{ y_{i1} y_{i2} \ln(\Phi_2(\beta_1 X_1, \beta_2 X_2, \rho)) + y_{i1}(1 - y_{i2}) \ln[\Phi(\beta_1 X_1) - \Phi_2(\beta_1 X_1, \beta_2 X_2, \rho)] + (1 - y_{i1}) \ln(\Phi(-\beta_1 X_1)) \}.
$$

We report the coefficients (β_2), standard errors and marginal effects of X_2 in Table 8. Consistent with our previous estimates, the Heckman logit estimation suggests that renters are more likely to become home owners after intra- and inter-state bank deregulations, with the latter has a larger impact: the probability of a renter becoming a homeowner increases by 1.9 percentage points after intra-state deregulation and by 5.0 percentage points after inter-state deregulation. Both impacts are significant at the one percent level.

Table 7: Comparative statistics for renters and homeowners

	Renters	**Homeowners**
Age	40.24	50.42
Race		
White	0.75	0.90
Black	0.23	0.08
Other	0.02	0.02
Female	0.42	0.19
Married	0.28	0.74
Children	0.62	0.73
Education	12.21	12.71
Health status		
Very good	0.23	0.24
Good	0.31	0.34
Fair	0.26	0.27
Bad	0.14	0.12
Very bad	0.05	0.03
Unemployed	0.06	0.02
Family income ($)	20705	42062
Wealth (excluding home, $)	20370	193718
State median house price ($)	79204	76452
Recourse	0.77	0.75
Number of observations	4060	5270

Table 8: Impact of Bank Deregulations on the Probability of Renters Becoming Home Owners
(Heckman Logit regression to control for potential sample selection bias)

	Marginal effect	Coef.	Significance level		Marginal effect	Coef.	Significance level
			Key regressors				
Intra-state deregulation	0.019	0.119	***				
		(0.029)					
Inter-state deregulation	0.050	0.312	***				
		(0.036)					
			Other regressors				
Demographic characteristics				**Socioeconomic status**			
Age	0.008	0.051	***	*Education (less than high school omitted)*			
		(0.005)		High school	0.024	0.151	***
Age squared	0.000	-0.001	***			(0.030)	
		(0.000)		College	0.060	0.372	***
Race (white omitted)						(0.031)	
Black	-0.084	-0.524	***	Unemployed	-0.114	-0.707	***
		(0.031)				(0.051)	
Other	-0.081	-0.504	***	Log(family income)	0.032	0.198	***
		(0.071)				(0.014)	
Female	-0.100	-0.624	***	*Quartile of wealth (1st quartile omitted)*			
		(0.028)		2nd quartile	0.028	0.177	***
Married	0.067	0.419	***			(0.029)	
		(0.033)		3rd quartile	0.114	0.707	***
# of Children	0.019	0.116	***			(0.032)	
		(0.013)		4th quartile	0.106	0.657	***
Change in # of children	0.065	0.404	***			(0.041)	
		(0.014)		**Housing market conditions**			
Health status (very good omitted)				Log(median house price)	-0.088	-0.548	***
Good	-0.026	-0.160	***			(0.053)	
		(0.026)		Mortgage rate	-1.875	-11.654	***
Fair	-0.051	-0.318	***			(1.006)	
		(0.029)		Recourse	-0.056	-0.349	***
Bad	-0.115	-0.716	***			(0.036)	
		(0.043)		**Inverse Mills Ratio**			
Very bad	-0.091	-0.568	***	IMR		-0.046	**
		(0.069)				(0.023)	
Year and state fixed effects				Yes			
Log likelihood				-29903			
Number of observations				9314			

4.3. Model Misspecification

4.3.1. The Probit Model

So far, we have assumed that the error term, $\varepsilon_{i,t}$, in the latent variable equation follows a logistic distribution. If $\varepsilon_{i,t}$ instead follows a normal distribution, the model becomes a probit model, and the most efficient estimation method is the probit estimation, the results of which are reported in Table 9.

The first column reports the results from the pooled probit regression, where the latent variable equation is same as (1), except that the error term, $\varepsilon_{i,t}$, follows a normal distribution. The second column reports the results from the random effect probit regression, where the latent variable equation is same as (3), with $\varepsilon_{i,t}$ being normally distributed. The third column reports the results from a Heckman probit regression to control for the potential sample selection bias. Similar to the Heckman logit model, The Heckman probit model is estimated using the maximum likelihood method. In all probit regressions, the controls are the same as in the specification of Column (4) of Table 3. Again, results from the various probit regressions (Columns 1 to 3 in Table 9) suggest that both the intra- and inter-state bank deregulations have positive impacts on home ownership: controlling for observables, the probability of a renter becoming a homeowner increases by 1.9 to 3.5 percentage points after intra-state deregulation, and by 5.2 to 7.4 percentage points after inter-state deregulation. Both effects are statistically significant at the one percent level.

Table 9: Impact of Bank Deregulations on the Probability of Renters Becoming Home Owners (Probit regressions and Propensity Score Matching Method)

	(1) Pooled Probit			(2) Random effect Probit			(3) Heckman Probit			(4) PSM	
	Marginal effect	Coef.	Sign. level	Marginal effect	Coef.	Sign. level	Marginal effect	Coef.	Sign. level	Marginal effect	Sign. level
Intra-state deregulation	0.019	0.067	***	0.035	0.162	***	0.025	0.072	***	0.023	***
		(0.017)			(0.026)			(0.017)		(0.003)	
Inter-state deregulation	0.053	0.192	***	0.052	0.242	***	0.074	0.209	***	0.049	***
		(0.021)			(0.032)			(0.021)		(0.002)	
IMR								0.067	**		
								(0.028)			
Other controls											
Demographic and socioeconomic Status		Yes			Yes			Yes		Yes	
Housing market conditions		Yes			Yes			Yes		Yes	
Year and state fixed effects		Yes			Yes			Yes		Yes	
Log likelihood		-29150			-28861			-98179		N/A	
Number of observations		4060			4060			4060		4060	

4.3.2. The Propensity Score Matching (PSM) Model

Both the logit and the probit models assume linear impacts of covariates on the latent variable. If this assumption is invalid, our previous estimators may be biased due to functional misspecification. To deal with this potential issue, we apply the matching method, more specifically the propensity score matching (PSM).

The matching estimation is obtained by simply comparing outcomes among households that received the treatment (i.e., the treatment group) versus those that did not (i.e., the comparison group). Using terminology from the matching literature, we define the outcome as the probability of renters becoming homeowners; the treatment group is defined as renters living in states that experienced bank deregulations (intra or inter); the comparison group is defined as renters living in states that did not experience bank deregulations.

One advantage of matching estimation (compared to regression) is that the key identifying assumption is weaker: the effect of covariates on the outcome need not be linear, as the matching method estimates the effect by matching households with the same covariates instead of a linear model for the effect of covariates. However, we should also note that matching is not a magic bullet to solve any unobservable variable bias. Similar to regression, matching is based on the assumption that the source of selection bias is the set of observed covariates. That is, matching estimators would be biased if selection (into living in deregulated states) was based on unobservable variables.

Finding matches that are similar with respect to all relevant covariates, however, can be difficult if the number of covariates is large and the sample is relatively small. Nevertheless, Rosenbaum and Rubin (1983) prove that matching on the (one-dimensional) propensity score (which is the estimated probability of a renter becoming a homeowner) suffices to adjust for the differences in the observed covariates. Matching on the propensity score is called propensity score matching, which is the technique we will use for the following estimation. The key

estimator is called the Average Treatment effect on the Treated (ATT), which has a similar interpretation to the marginal effects in the logit and the probit models: they measure the difference in the probability of becoming homeowners between renters in states experiencing deregulation and renters in the other states not experiencing deregulation.

The matching process takes two steps. We first identify all renters in a given state, and then, within that state, match each renter in the treatment group with a renter in the comparison group, according to their propensity scores, which are estimated by probit regressions controlling for renters' demographic and socioeconomic status. We repeat these two steps for each state, and finally calculate the difference in the share of renters becoming home owners across the treatment group and the matched comparison group. The matching algorithm used in the second step is the nearest neighbor matching. That is, for each renter in the treatment group, we find the "closest" renter in the comparison group, where the "closest" is defined by the distance between propensity scores.

The ATTs, and the corresponding standard errors, are reported in Column (4) of Table 9. Consistent with our previous estimators, the PSM results show that inter-bank deregulation has a larger impact than intra-bank deregulation on the probability of renters becoming homeowners: the probability increases by 4.9 percentage points after inter-state deregulation, and 2.3 percentage points after intra-state deregulation. Both impacts are significant at the one percent level.

Identification of the PSM estimation relies on the hypothesis that the distributions of the propensity scores for the treatment group (i.e., renters in states experiencing bank deregulations) and for the comparison group (i.e., renters in states not experiencing bank deregulations) overlap with each other in a wide range. To test this hypothesis, we draw the distributions of propensity scores for the treatment and the comparison groups in Figure 1 (for intra-state deregulation) and

Figure 2 (for inter-state deregulation). A visual inspection of the two charts suggests that the

hypothesis is satisfied, and therefore the PSM estimation is well identified.

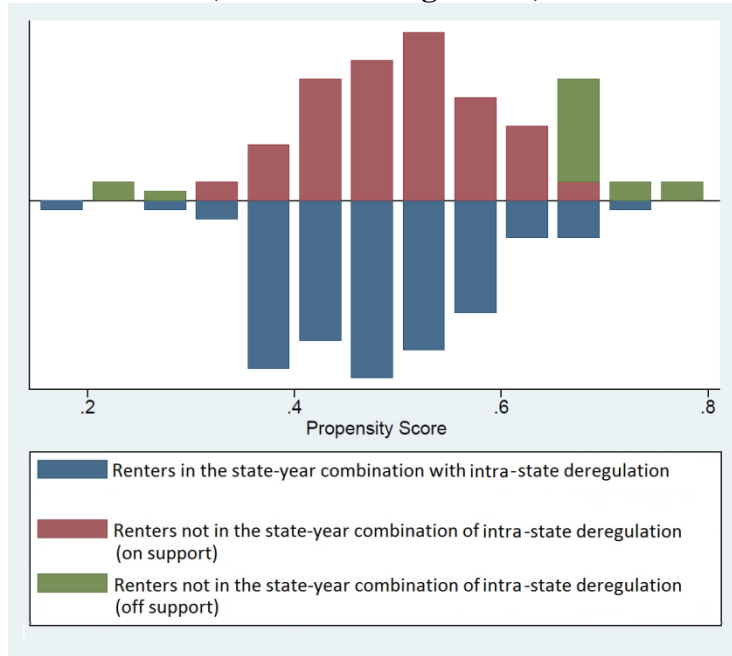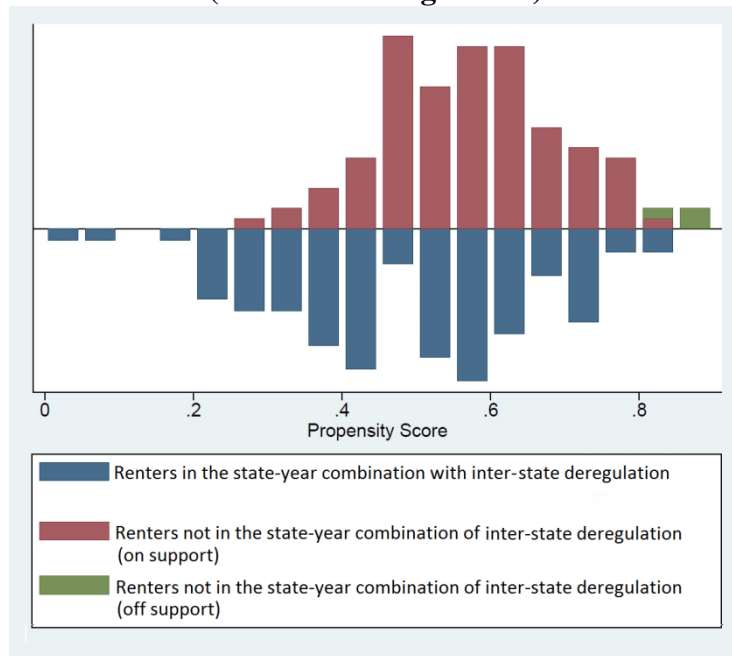**Figure 1: distributions of propensity scores for the treatment and the comparison groups (*intra-state* deregulation)**

Figure 2: distributions of propensity scores for the treatment and the comparison groups (*inter-state* deregulation)

5.   Concluding Remarks

During 1970s-1990s, most states in the U.S. removed restrictions on intra-state branching and inter-state banking, which intensified bank competition and increased credit supply. In this paper, we assess the impact of banking deregulations on home ownership. In particular, we study whether renters are more likely to become homeowners after the states they reside experience banking deregulation.

By following a sample of renters in the Panel Study of Income Dynamics (PSID), we find strong evidence of a positive impact of banking deregulations on the transition rate of renters to homeowners: after controlling for observables, renters in states that experience banking regulations are 6.8 percentage points more likely to become homeowners, all else being equal. Given that the unconditional transition rate from renters to home owners is 26.5 percent, the 6.8 percentage points increase indicates that banking deregulations, by removing the barriers to branching within state and to out-of-state bank entry, can explain as high as a 25.7% increase in transition probability from renters to homeowners. Our results are robust to potential sample-selection bias and functional misspecifications.

We explore two potential channels underlying these findings. Consistent with the prior literature, first, we find that the banking deregulations have boosted incomes in the lower part of the income distribution, which increases the capacity for low-income households to qualify for mortgage loans. Second, banking deregulation allows mortgage credits to be extended to more households, most importantly to higher risk households. This is consistent with the view that banking deregulation increases credit supply through the use of new screening technology to more risky households.

The identification of the two channels has important policy implications, especially given a large drop in home ownership rate since the recent housing crisis. Our findings suggest that

government policy aiming to increase credit supply will have a significant effect on improving

the home ownership rate.

References

Amore, M., C. Schneider, and A. Zaldokas. 2013. Credit Supply and Corporate Innovation. *Journal of Financial Economics* 109, 835-855.

Beck, T., R. Levine, and A. Levkov. 2010. Big Bad Banks? The Winners and Losers from Bank Deregulation in the United States. *The Journal of Finance* 65, 1637–1667.

Black, S. and P. Strahan. 2002. Entrepreneurship and Bank Credit Availability. *The Journal of Finance 57*, 2807-2833.

Cetorelli, N. and P. Strahan. 2006. Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local U.S. Markets. T*he Journal of Finance* 1, 437-461.

Charles, K. and E. Hurst. 2002. The Transition to Home Ownership and the Black-White Wealth Gap. *The Review of Economics and Statistics* 84, 281-297.

Chu, Y. Banking Competition, Credit Supply, and Risk-Taking: Evidence from the Real Estate Market. *Working Paper*, 2015

Coulson, E. 1999. Why are Hispanic- and Asian-American Homeownership Rates So Low? Immigration and Other Factors. *Journal of Urban Economics* 45, 209-227.

Coulson, E. 2002. Housing Policy and the Social Benefits of Homeownership. *Business Review of the Federal Reserve Bank of Philadelphia* 2, 7-16.

Dick, A. and A. Lehnert. 2010. Personal Bankruptcy and Credit Market Competition. *The Journal of Finance* 2, 655-686.

Dubin, J and D. Rivers. 1989. Selection Bias in Linear Regression, Logit and Probit Models. *Sociological Methods and Research* 18, 360-390.

Eilbott, P and E. Binkowski. 1985. The Determinants of SMSA Homeownership Rates. *Journal of Urban Economics* 17, 293-304.

Favara, G. and J. Imbs. 2015. Credit Supply and the Price of Housing. *American Economic Review* 105, 958-992.

Glaeser, E. and B. Sacerdote. 1999. Why is There More Crime in Cities? *Journal of Political Economy* 107, 225-258.

Goetz, M., L. Laeven, and R. Levine. 2013. Identifying the Valuation Effects and Agency Costs of Corporate Diversification: Evidence from the Geographic Diversification of U.S. Banks. *Review of Financial Studies* 26, 1787-1823.

Green, R., and M. White. 1997. Measuring the Benefits of Homeowning: Effects on Children. *Journal of Urban Economics* 41, 441-461.

Gyourko, J. and P. Linneman. 1996. Analysis of the Changing Influences on Traditional Households' Ownership Patterns. *Journal of Urban Economics* 39, 318-341.

Gyourko, J., P. Linneman and S. Wachter. 1999. Analyzing the Relationship among Race, Wealth and Home ownership in America. *Journal of Housing Economics* 8, 63-89.

Herbert, C., D. McCue and R. Sanchez-Moyano. 2013. Is Homeownership Still an Effective Means of Building Wealth for Low-income and Minority Households? (Was It Ever?). Harvard Unversity, Joint Center for Housing Studies.

Hilber, C. and Y. Liu. 2008. Explaining the Black-White Homeownership Gap: The Role of Own Wealth, Parental Externalities and Locational Preferences. *Journal of Housing Economics* 17, 152-174.

Jayaratne, J. and P. Strahan. 1996. The Finance-Growth Nexus: Evidence from Banking Branch Deregulation. *Quarterly Journal of Economics* 111, 639-670.

Jayaratne, J. and P. Strahan. 1998. Entry Restrictions, Industry Evolution and Dynamic Efficiency: Evidence from Commercial Banking. *Journal of Law and Economics* 41, 239-273.

Kain, J. and J. Quigley. 1972. Housing Market Discrimination, Home-ownership, and Savings Behavior. *American Economic Review* 62, 263-277.

Kerr, W. and R. Nanda. 2010. Banking Deregulations, Financing Constraints, and Firm Entry Size. *Journal of the European Economic Association* 8, 582-593.

Kroszner, R. and P. Strahan. 1999. What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Deregulation. *Quarterly Journal of Economics* 114, 1437-1467.

Munnell, A., G. Tootell, L. Browne, and J. McEneaney. 1996. Mortgage Lending in Boston: Interpreting HMDA Data. *American Economics Review* 86, 25-53.

Rosenbaum, P. and D. Rubin. 1983. The Central Role of the Propensity Score in Observational Studies For Causal Effects. *Biometrika* 70, 41–50.

Rice, T. and P. Stranhan. 2010. Does Credit Competition Affect Small-Firm Finance? *Journal of Finance* 3, 861-889.

Strahan, P. 2003. The Real Effects of U.S. Banking Deregulation. *The Federal Reserve Bank of St. Louis Review* 85, 111-128.

Vigdor, J. 2006. Liquidity Constraints and Housing Prices: Theory and Evidence from the VA Mortgage Program. *Journal of Public Economics* 90, 1579-1600.

Yinger, J. 1995. Closed Doors, Opportunities Lost: The Continuing Costs of Housing Discrimination. Sage, New York