The Effect of Government Mortgage Guarantees on Home Buying and Home Ownership

Serafin Grundl and You Suk Kim*

Preliminary and incomplete. Please do not cite without permission.

September 1, 2017

Abstract

The U.S. federal government guarantees a vast majority of mortgages through the government sponsored enterprises and the federal housing administration. Although the government's involvement in mortgage financing is controversial, it is often justified to make mortgage credits more available and thereby promote home ownership. However, very little is known about the effects of government mortgage guarantees on home buying and home ownership. To estimate the effects, we implement a difference-in-difference design, with detailed property-level data, that exploits regional changes in upper limits of the mortgage size that can be guaranteed by the government. We find that government guarantees do not have their intended effects on home ownership: although the guarantees have positive effects on house transactions coupled with an increase in mortgage origination, home ownership rates do not increase.

*Meher Islam provided outstanding research assistance. Federal Reserve Board of Governors, serafin.j.grundl@frb.gov, you.kim@frb.gov. We thank Scott Frame for helpful comments. The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the staff, by the Board of Governors, or by the Federal Reserve System.

1 Introduction

A vast majority of residential mortgages in the U.S. are guaranteed or insured by the government through the Government Sponsored Enterprises (GSEs), such as Freddie Mac and Fannie Mae, and the Federal Housing Administration (FHA). The large presence of the government in mortgage financing is controversial because it exposes taxpayers to the risks of the mortgage market and potentially leads to misallocation of capital. In fact, the two GSEs were near bankrupt in the financial crisis in 2008 and received the government's bailout. After the financial crisis, several proposals were made to reduce the role of the government in mortgage financing.[1]

Despite this criticism, the government's involvement in mortgage financing is often justified with the goal of making mortgage credits more available and thereby promoting home ownership. However, very little is known about whether and how much the government mortgage guarantees leads to additional home buying, and whether and how much the additional home buying leads to an increase in home ownership.

In this paper, we exploit regional changes in upper limits of loan sizes that can be guaranteed by the GSEs or insured by the FHA to estimate the effects of government guarantees on home buying and home ownership. The "conforming loan limits" (CLLs) restrict the government's role to mortgage with principals below a certain limit. In 2008 these limits were temporarily increased for GSE and FHA loans in certain counties with high median house prices but remained constant elsewhere. In 2011 the limits for GSE loans were decreased. Later, in 2014 the limits for FHA loans were decreased again. The three changes in loan limits provides three treatments, and we implement a difference-in-difference (DiD) approach to estimate the effects of each treatment.

Although increases in the CLLs make it possible for more loans to be guaranteed by the government, the effects on home buying and home ownership rate are unclear. Banks always have the option of keeping mortgages on their portfolio without securitizing them with guarantees from the government. Therefore, the additional government guarantees might not have a large net positive impacts on home buying as long as the private capital is available to meet the demand for mortgages. Moreover, the CLL increase will have an effect not only on potential first-time home buyers but also on other buyers. If the effect on the other buyers is large and leads to house price increases, the home ownership rate could even fall as a consequence of the CLL increase.

For our empirical analysis, we use the CoreLogic real estate database, which provides information about characteristics of houses and their transactions at the individual property level. This database is particularly suitable for studying home ownership because we are able to track whether a house is owner-occupied over time and whether the owner-occupancy status changed as a result of a property transaction. Moreover, the database allows us to control for differential trends for houses with different characteristics, which may be a potential threat to identification with a DiD approach if uncontrolled.

Using a DiD approach that exploits the regional changes in CLLs, we find that changes in CLLs

[1] For example, see the Housing Refinance Reform and Taxpayer Protection Act proposed in 2013 and 2014

affect the total amount of mortgages guaranteed by the government. The increase in CLLs in 2008 and decrease in FHA limits in 2014 led to an increase and decrease in the total loan amounts guaranteed by the government, respectively. The changes in the amounts of government guarantees also had positive effects on home buying. We find that houses in treated counties are more and less likely to be transacted as a result of the increase and decrease of CLLs in 2008 and 2014, respectively. However, we do not find that an increase in mortgage availability due to government guarantees does not lead to a net positive effect on home ownership. The increase in CLLs in 2008 had no effects on home ownership, and the decreases in CLLs in 2011 and 2014 had no effect and even positive effect on home ownership.

These findings suggest that the government's involvement in mortgage financing though its guarantees does not have its intended effect on home ownership. Although the guarantees have positive effects on house transactions with an increase in mortgage origination, home ownership does not necessarily move in the same direction.

An important caveat to our empirical strategy using the regional CLL changes for high-price markets is that we cannot determine the overall effect of the GSEs and the FHA on home ownership. Importantly, as the changes are regional we cannot study macroeconomic effects that would be present if the role of the government in the mortgage market would be reduced in the entire country. Moreover, the changes we observe only affect relatively large mortgages (>\$417,000) in high-price markets. However, this segment of the housing market plays an important role in recent discussions about the declining home ownership rate. It is often argued that potential first-time home buyers in these markets cannot qualify for a sufficiently large mortgage.

Literature This paper is related to several strands of literature. First, this paper is related to the literature that studies the effects of government mortgage guarantees on the mortgage market. A large body of works in the literature studied how GSE-eligibility affected mortgage interest rates by comparing jumbo and conforming rates. Early works include Passmore et al. (2005) and Sherlund (2008). More recently, Kaufman (2014) used the regression discontinuity design around the CLL to estimate the effect of GSE-eligibility on mortgage characteristics such as interest rates. In addition, Fuster and Vickery (2015) study that the effects of securitization on the prevalence of fixed-rate mortgages, exploiting the fact that it is more difficult to securitize a jumbo mortgage above the CLL. To our knowledge, however, there is no existing work that studies the effects of government guarantees on home buying and home ownership, which is a primary justification for the government's involvement in mortgage financing.

Second, this paper is also related to the literature that studies home ownership. There are many papers that study mortgage interest tax deduction and home ownership, including Poterba (1984), Glaeser and Shapiro (2003), Hilber and Turner (2014), and Sommer and Sullivan (forthcoming). However, there are relatively few papers that study the effect of credit market conditions on home ownership. Fetter (2013) use the mid-century GI-bills to study the effect of mortgage subsidies on home ownership among veterans. Acolin et al. (2016) and Fuster and Zafar (2016) study the

role of borrowing constraints on home ownership using survey data. This paper contributes to this literature by studying the effects of credit availability resulting from changes in government guarantees on home ownership.

Third, another related body of works is the literature that studies the effects of credit conditions on the housing market. There are many papers that study the effects of interest rates on various market outcomes: mortgage size (DeFusco and Paciorek (2017)), housing market dynamics (Anenberg and Kung 2017), and home buying (Bhutta et al. 2017). Moreover, Adelino et al. (2012) and Kung (2014) study the effects of credit availability on house prices, exploiting an increase in CLLs in different times, and Anenberg et al. (2016) study the effects of credit availability on construction as well as house prices using a different identification approach.

Lastly, this paper is also related to macroeconomic works that study the effects of the GSEs on the broader economy and financial system. Jeske et al. (2013) and Gete and Zecchetto (2017) study the distributional impacts of the government mortgage guarantees in the economy. Elenev et al. (2016) study the effects of phasing out the GSEs on the mortgage, housing and financial markets, allowing for rich interactions between the markets.

The rest of the paper is organized as follows. In Section 2, we present the background on the GSEs and the policy change we use for our main analysis. In Section 3, we discuss the main data we exploit for our analysis. In Section 4, we discuss our empirical strategy. In Section 5 and 6, we present the results on home buying and home ownership. In Section 7, we conclude.

2 Changes in Conforming Loan Limits

The GSEs and the FHA only purchase and insure mortgage loans below a certain limit for the mortgage principal, called the conforming loan limit (CLL). Loans that are above this limit are called jumbo loans and either have to stay on the balance sheets of the lender or have to be privately securitized. The CLL therefore limits the government's involvement in the mortgage market.

In this paper we exploit changes in the CLL for counties with high median house prices. If the CLL increased, a larger fraction of loan becomes eligible for the GSEs and the FHA so the role of the government in these markets increases. In 2008 the CLL increased in high-price counties to mitigate the effects of the housing bust. Later, in 2011 for the GSEs, and in 2014 for the FHA the CLLs were reduced again. Table 1 provides an overview of these changes.

Table 1: **Changes in Conforming Loan Limits.** This table reproduces Table 1 in Goodman et al. (2014). It shows the changes in the loan limits and ceilings for the GSEs and the FHA.

Period	Statutory Authority	FHA			GSEs	
		Limit	Ceiling ($)	Floor ($)	Limit	Ceiling (%)
2006-2/12/2008	-	95% of Med HP	362,790	200,160	417,000	417,000
2/13/2008-9/30/2011	ESA	125% of Med HP	729,750	271,050	125% of Med HP	729,750
10/1/2011-11/17/2011	HERA	115% of Med HP	625,500	271,050	115% of Med HP	625,500
11/18/2011-12/31/2013	ESA	125% of Med HP	729,750	271,050	115% of Med HP	625,500
1/1/2014 forward	HERA	115% of Med HP	625,500	271,050	115% of Med HP	625,500

Consider the changes for GSE loans first. The national GSE-CLL for a single-family houses had increased from $33,000 in the early 1970s to $417,000 in 2006, and it stayed at $417,000 until 2008.[2] In 2008 the CLL temporarily increased for certain areas with high housing costs as a result of the Economic Stimulus Act (ESA) and the Housing and Economic Recovery Act (HERA). The two Acts were introduced to help the economy recover from the Great Recession. The two acts used different formulas to determine the CLL for each county. A county's CLL based on the ESA is calculated as the higher of $417,000 and 125 percent of the county's median home price, but is capped at $729,750. A county's CLL based on the HERA is calculated as the higher of $417,000 and 115 percent of the county's median home price, and is capped at $625,500. Whenever the two formulas resulted in different CLLs, the higher number based on the ESA was applied as long as the ESA was in effect until September 2011. The increased CLL was applied to loans originated in July 2007 or after, and the same CLL was effective up to loans originated by the end of September 2011. The higher CLL based on the ESA expired in October 2011 while the CLL based on the HERA was still in place. As a result, the CLL based on the HERA was applied to loans originated in October 2011 or after. In summary, GSE-CLLs increased in counties with high median house prices in February 2008 and decreased in October 2011 whereas CLLs stay unchanged at $417,000 in counties with relatively low median house prices.

Next consider the changes for FHA loans. In February 2008 the FHA-CLL was increased from of 95% of the median house price, with a ceiling of $362,790 to 125% of the median house price with a ceiling of $729,750. At the same time the floor was increased from $200,160 to $271,050. Starting at the beginning of 2014 the limit was again reduced to 115% of the median house price with a ceiling of $625,500.[3]

To summarize, there are three changes in CLLs that we use in our empirical analysis. For the rest of this paper, we will sometimes refer to each instance of a change in CLLs to a treatment. The first treatment is the increase in the CLLs for both the GSEs and the FHA in February 2008 (referred to as T_1, henchforth). The second treatment is the decrease in the CLLs only for the GSEs

[2]Except for the four statutorily-designated high cost areas such as Alaska, Hawaii, Guam and the U.S. Virgin Islands, the same CLL was applied to the entire region in the United States despite large heterogeneity in house price levels across different regions.

[3]The table also shows that the limit for FHA loans was decreased temporarily between 10/1/2011 to 11/17/2011. This temporary decrease affected such a short time window that it is not useful for identification purposes.

in October 2011 (referred to as T_2, henchforth). The third treatment is the decrease in the CLLs only for the FHA in January 2014 (referred to as T_3, henchforth). For each treatment, we consider a two-year time window centered around the month when each treatment took place: February 2007 – January 2009 for T_1, October 2010 – September 2012 for T_2, and January 2013 – December 2015 for T_3.

3 Data

The main data set we use for our analysis is CoreLogic Real Estate Data (CoreLogic data, henceforth). We use a 20% random sample of the entire CoreLogic data because the entire data set is extremely large to a point that makes a statistical analysis extremely time-consuming. This data set provides multiple files that contain different types of information. For this paper, we use the file with information about individual house transactions (the transaction file) and the file with information about characteristics of individual houses in many counties (the tax file).

The transaction file provides detailed information about individual house transactions such as the date of house sale, mortgage characteristics associated with the sale, whether a buyer occupies the house, etc. Important variables from the tax file are whether a house is owner-occupied and the assessed value of a house by tax authorities. Information about whether a house is owner-occupied is crucial for studying home ownership. We need to observe the owner-occupancy status of a house before and after its sale to see whether a house sale leads to a net increase or decrease in home ownership. Thus, this data set allows us to analyze the effects of the loan limit changes on home buying and home ownership at the individual house level.

The assessed value of a house is important in predicting a loan size necessary to purchase a house without selection bias. Many of previous papers on related topics used house appraisal value or list prices of houses on the market. However, if certain houses are more likely to be on the market than other houses, then any house valuation measures that are only available for houses on the market will be subject to selection bias. Because the changes in loan limits, which we exploit for identification, affects disproportionately more houses that would require larger loans, having a measure of a house value that is free of selection. With this information about the value of a house, moreover, it is possible to control for potential differential trends that are common for houses with similar values, which may be a threat to a DiD approach we will use for our main analysis.

We select our sample in the following way. First, we only keep residential properties such as a single-family house or a condo in the sample. Throughout the paper, we will refer to residential properties including a condo included in the sample as houses. Second, we keep properties that show up in the tax file at least once in two years before each treatment year. For T_1, the universe of houses consists of houses that show up in the tax record in 2006 and 2007. For T_2, the universe consists of houses in the tax record file in 2009 and 2010. For T_3, the universe consists of houses in 2012 and 2013. Third, we also drop houses with missing assessed value of houses, which make up about 10% of the remaining sample. Lastly, we also drop houses with missing information about

whether they are owner-occupied, which make up about 10% of the remaining sample.

3.1 Summary Statistics

Table 2 presents descriptive statistics of pre-treatment periods. The unit of observation of the data we use for the main analysis is a pair of house and quarter. As mentioned earlier, we consider three treatments associated with different changes in loan limits for the GSE and FHA. Columns (1) and (2) present statistics for houses in untreated and treated counties in four quarters before the increase in loan limits for the GSE and FHA in March 2008, respectively. Similarly, columns (3) and (4) present pre-treatment statistics for the decrease in the GSE loan limit in October 2011. Lastly, columns (5) and (6) present pre-treatment statistics for the decrease in FHA loan limit in January 2014.

The table shows that about 1% of houses are sold in each quarter. A majority of house are bought with mortgages, and houses in the treated counties are slightly more likely to be bought with mortgages. Nevertheless, a nonneglible fraction of houses are bought with cash.

The table also shows that houses in treated and untreated counties are quite different in terms of the average house values assessed by tax authorities. The average value of a treated house is assessed to be greater than that of a untreated house by more than $150,000. This is consistent with the fact that whether loan limits for a county increased in 2008 was determined by the county's median house price. Consistently, treated houses are more likely to be "large" houses, which we define to be houses with assessed values greater than 125% of $417,000 (the old GSE loan limit). If a borrower takes out a mortgage with 80% loan-to-value ratio, then one would need a mortgage greater than the old loan limit to purchase such a house. These houses are particularly of our interest in this paper because demand for these houses are likely to be directly affected by changes in limits. The table shows that close to 10% of treated houses are large, whereas the fraction of large houses are only around 1% in untreated houses. Accordingly, treated houses are more likely to be bought with super conforming mortgages, which are defined to be mortgage between $417,000 (the old GSE loan limit) and $725,500 (the highest new loan limit). Around 10% of treated houses were purchased with super conforming mortgages, whereas only a very small fraction of untreated houses were purchased with such mortgages.

Table 2: Descriptive Statistics

	GSE & FHA Limits Inc.		GSE Limit Dec.		FHA Limit Dec.	
	(1) Untreated	(2) Treated	(3) Untreated	(4) Treated	(5) Untreated	(6) Treated
% Sale	1.04	.884	.768	.9	.978	1.07
% Sale with Mortgage	.728	.741	.423	.617	.559	.708
House Value ($1000)	101	265	93.4	262	94.5	273
% Large House	1.2	11.7	1.02	10.8	1.13	11.1
% Sale with Super-Conforming Loan	.0156	.104	.00563	.0744	.0107	.102
% Owner-Occupied	80.5	83.3	77.2	80.5	73.7	77.4
% Purchase by Occupier	.626	.641	.43	.588	.543	.664
N. Obs.	29,520,712	14,446,176	40,729,904	15,520,256	50,796,680	18,250,376

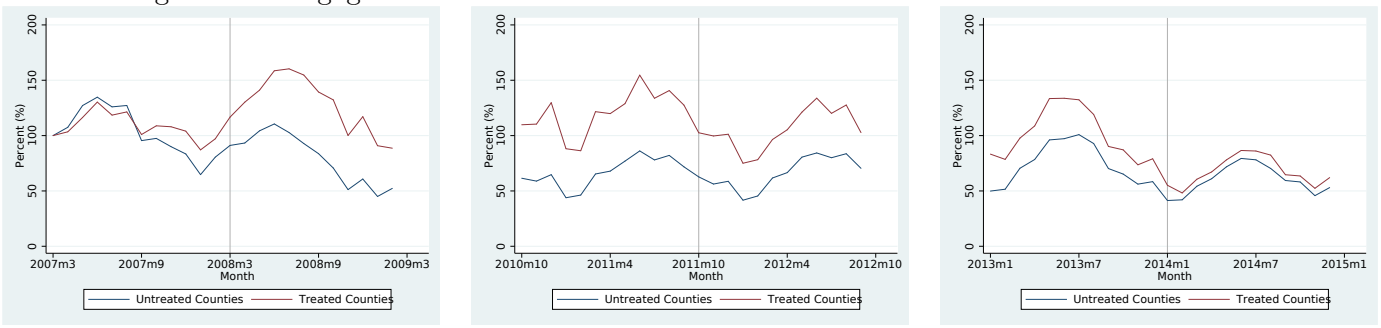
3.2 Trends in Mortgage Credits Guaranteed by the Government

Figure 1 describes the evolution of the amount of mortgage credit extended with guarantees from the GSEs or the FHA insurance in treated and untreated counties, which is calculated from the Lender Process Servicing (LPS) data. To facilitate a comparison between treated an untreated counties, we measure the total credit in treated counties at a give time relative to the total credit extended in treated counties in March 2007. We also normalize the total credit in untreated counties in the same way.

Panel (a) of Figure 1 shows that the increase in the GSE and FHA loan limits in March 2008 led to an increase in mortgage credits associated with the government in treated counties. For the twelve-month period from March 2008 to February 2009, the total amount of mortgage credits guaranteed by the GSEs or insured by the FHA increased by 18% relative to the previous twelve-month period based on the LPS data. In the data, the 18% increase corresponds to an increase of $14 billion in mortgage origination associated with the GSEs or FHA. Because the LPS data covers about 50–60% of the entire mortgage market, the exact extent of an increase in the government's presence in the mortgage market is likely much higher than $14 billion.

Panel (b) of Figure 1 shows that the GSE limit decrease in October 2011 did not lead to a significant drop in mortgage credits associated with the government probably because the FHA loan limit did not decrease at the same time. However, Panel (c) shows that the decrease in the FHA loan limit seemed to lead to a decrease in mortgage credits associated with the government.

Figure 1: Mortgage Credit Extended with Guarantees from the Government



(a) GSE & FHA Limits Increase (b) GSE Limit Decrease (c) FHA Limit Decrease

4 Regression Specification

We investigate how the changes in loan limits affected various outcomes of our interest with a DiD approach as follows:

$$y_{it} = \beta_1 Post_t + \beta_2 Treated_{c(i)} \times Post_t + X_{it}\beta_x + \xi_{c(i)} + \epsilon_{it}. \quad (1)$$

As mentioned earlier, we consider three treatments: T_1, T_2, and T_3. We run separate regressions for each treatment.

The unit of analysis is at the level of a house (i) and time (t) pair. Time t is defined as a group of three consecutive months, and t takes on a value ranging from 1 to 8 because we consider the two-year time window centered around the month each treatment took place. For example, $t = 1$ for February, March, and April 2007 for T_1, and $t = 5$ for the month when each treatment takes place and following two month. $Post_t$ is a dummy variable that is equal to one for times after the treatment ($t \geq 5$). $Treated_{c(i)}$ is a dummy variable that is equal to one if house i' county $c(i)$ is treated. Note that the stand-alone term of $Treated_{c(i)}$ is not included in equation (1) because of county fixed effects $\xi_{c(i)}$. The main coefficient of interest is β_2.

Vector X_{it} contains house characteristics that may be correlated with y_{it}. We include in X_{it} many interactions of $Post_t$ and a location of house i's assessed house value in the distribution of house values. We construct two sets of such interactions. First, we create a categorical variable with 20 bins with an equal number of observations, based on a location of house i in the distribution of assessed house values within the house's county. For example, this variable is equal to one for houses with assessed values in the bottom 5% of the distribution within a county, and the variable is equal to 20 for houses with assessed values in the top 5% of the distribution. Because we take the assessed value of house from the pre-treatment period, this categorical variable is time invariant. Thus, we interact each value of the variable with $Post_t$, creating 40 additional variables including 20 stand-alone dummy variables for each value of the categorical variable and another 20 variables that are interactions between the dummy variables and $Post_t$. Second, we create another categorical variable with 20 bins based on a location of house i in the distribution of assessed house values in

the whole data sample. We also include interactions between each value of this variable with $Post_t$ in X_{it}.

These variables in X_{it} will help to control for potential different trends for different house values, which is possible because we have access to the house-level data. The first set of interactions will control for such trends for houses with similar values relative to other houses in counties where they are located. The second set of interactions will control for such trends for houses with similar absolute values. Controlling for differential trends is especially important for us because the identifying assumption of a DiD approach rules out unobserved differential trends across treated and untreated groups that are correlated with the treatment.

When estimating equation (1), we do not condition on just houses that would be directly affected by changes in loan limits. Although the loan limit changes would only directly affect houses that would typically require mortgages greater than pre-treatment loan limits, the loan limit changes may have spillover or equilibrium effects on other houses. Thus, the DiD approach in equation (1) will capture both direct and indirect effects on houses in treated counties. The identifying assumption for the DiD approach is that there do not exist unobserved differential trends across treated and untreated counties that are correlated with the treatment.

A potential threat to the identifying assumption with the DiD approach is a differential trend for houses in a certain county. If this trend is common for all houses in a county, then we can difference out the trend by taking an additional difference between houses directly and indirectly affected by the treatment. This motivates an alternative specification using the triple-difference approach as follows:

$$\begin{aligned} y_{it} &= \beta_1 Post_t + \beta_2 Treated_{c(i)} \times Post_t + \beta_3 Treated_{c(i)} \times Post_t \times Large_i \\ &\quad + \beta_4 Large_i + \beta_5 Post_t \times Large_i + \beta_6 Treated_{c(i)} \times Large_i + X_{it}\beta_x + \xi_{c(i)} + \epsilon_{it}. \end{aligned} \tag{2}$$

A new variable $Large_i$ is a dummy variable that is equal to one if house i's assessed value is greater than 125% of the old GSE loan limit ($417,000). We will refer to houses with $Large_i$ equal to one as "large" houses. In this equation, β_3 measures differential effects of the treatment on large houses, whereas β_2 captures a common trend that affects houses in treated counties. The common trend can be different across treated and untreated counties and capture any indirect spillover or equilibrium effects on houses that are not "large."

5 Effects on House Sales

In this section, we discuss the effects of the loan limit changes on house sales. Table 3 and 4 present regression results with X_{it} and without X_{it}, respectively. Based on the estimates, we believe that the DiD results shown in columns (1), (3), and (5) might be affected by differential trends that affected houses in certain counties. In particular, column (5) in Table 3 suggests that the decrease in the FHA loan limit is associated with an increase in house sales in treated counties, which is very difficult to justify with a standard theory. Thus, we will focus on the estimates of β_3 in equation

(2), which are reported in columns (2), (4), and (6).

With the triple-difference approach, we find that T_1 and T_3 affected house sales, while T_2 does not affect house sales. In particular, an increase and decrease in loan limits in T_1 and T_3 led to an increase and decrease in house sales, respectively. The changes in house sales caused by T_1 and T_3 are economically significant. Given that the average probability that a house is sold is around 1% in a quarter, the increase of 0.25pp and the decrease of 0.44pp with T_1 and T_3, respectively, are very large changes.

Although T_1 and T_3 led to changes in house sales in an expected way, we find that T_2 does not lead to statistically significant changes in house sales. A potential reason that explains the difference in the treatment effects is that the FHA lending is usually more catered to borrowers who do not have other sources to take out mortgages. In contrast, loans that were sold to the GSEs were more likely to be made to prime borrowers, who are less constrained compared with a typical FHA borrower. Thus, even when GSE loan limits decreased in T_2, a borrower that would have taken out a GSE loan might be able to take out a loan above a lower loan limit as a jumbo mortgage from a bank. Around the time when T_2 took place, moreover, banks were much more willing to make jumbo mortgages that they held on their balance sheets compared with 2008.

Table 3: Effects on Home Sale with Controls

	GSE & FHA Limits Inc.		GSE Limit Dec.		FHA Limit Dec.	
	(1)	(2)	(3)	(4)	(5)	(6)
Post=1	-.0014***	-.0014***	.00011	.00011	.000045	2.0e-06
	(.0004)	(.0004)	(.00015)	(.00015)	(.0002)	(.00019)
Post=1 × Treated=1	.0008*	.00071*	-.00028*	-.00028*	.00057**	.00076**
	(.00045)	(.00045)	(.00015)	(.00015)	(.00029)	(.00031)
Large=1		-.00081		.00071**		-.0021***
		(.00074)		(.00034)		(.00078)
Post=1 × Large=1		-.0033***		-.00067**		.002***
		(.00072)		(.00029)		(.00058)
Treated=1 × Large=1		.0025***		-.00006		.0058***
		(.00087)		(.00049)		(.0014)
Post=1 × Treated=1 × Large=1		.0025***		.00015		-.0044***
		(.00065)		(.00033)		(.00097)
Other Control	Y	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y	Y
N. Obs.	87,933,776	87,933,776	112,500,320	112,500,320	138,094,112	138,094,112
Adj. R^2	0.001	0.001	0.002	0.002	0.002	0.002

Table 4: Effects on Home Sale without Controls

	GSE & FHA Limits Inc.		GSE Limit Dec.		FHA Limit Dec.	
	(1)	(2)	(3)	(4)	(5)	(6)
Post=1	-.0016***	-.0016***	.00091***	.00091***	-.0017***	-.0017***
	(.0002)	(.0002)	(.000058)	(.000059)	(.00012)	(.00012)
Post=1 × Treated=1	.0018***	.0015***	-.00031**	-.0003**	.00064***	.0012***
	(.00054)	(.00054)	(.00013)	(.00014)	(.0002)	(.00028)
Large=1		.00033		.0018***		.00014
		(.00066)		(.0004)		(.00036)
Post=1 × Large=1		-.00017		-.00034*		.00004
		(.00037)		(.00024)		(.00027)
Treated=1 × Large=1		.0017*		-.00061		.0056***
		(.00094)		(.00052)		(.0014)
Post=1 × Treated=1 × Large=1		.0025***		.00022		-.0047***
		(.00068)		(.00032)		(.001)
Other Control	N	N	N	N	N	N
County FE	Y	Y	Y	Y	Y	Y
N. Obs.	87,933,776	87,933,776	112,500,320	112,500,320	138,094,112	138,094,112
Adj. R^2	0.001	0.001	0.001	0.001	0.002	0.002

6 Effects on Home Ownership

In Section 4, we showed that the loan limit changes affected home sales in treated counties. Now we investigate whether the changes in home sales caused by the loan limit changes led to any changes in home ownership. Our measure of home ownership is whether a house is occupied by an owner. The person who owns a house does not necessarily live in the house and can always have the house as an investment purpose.

We use the same empirical approach as in equations (1) and (2). In these regressions, we use a change in house i's owner-occupancy status as the dependent variable. The owner-occupancy status of a house can change either when an owner-occupied house is sold to a buyer that does not live in the house or when a non-owner-occupied house is sold to a buyer that lives in the house. Even if a house is sold, it possible that there is no change in the owner-occupancy status. If there is no sale of a house at a time, then a house's owner-occupancy status does not change either. To measure the change in the owner-occupancy status, we construct the dependent variable y_i such that $y_{it} = 1$ if the house's status changes from being owner-occupied to being non-owner-occupied. In the opposite case, $y_{it} = -1$. If there is no change in the status, $y_i = 0$.

Note that the home ownership rate is a stock measure. With the dependent variable we consider, we estimate the effects of the loan limit changes on a change in home ownership, which is a flow measure. An alternative approach to estimate the effect on home ownership is to use the stock measure as a dependent variable. However, we chose to use the flow measure as a dependent variable because it requires a less restrictive identifying assumption than the stock measure of home

ownership for the DiD approach to be valid. The usual identifying assumption for the DiD is that there is no unobserved differential trends across treated and untreated groups that are correlated with the treatment. Then with the stock measure of home ownership as a dependent variable, the identifying assumption is that rates at which home ownership changes must be the same, controlling for the loan limit changes and observed house characteristics. However, for example, if rates of home ownership changes are different across treated and untreated groups of counties but are constant over time within a group, then the DiD assumption for the stock measure will be violated. In contrast, the example would not violate the DiD identifying assumption for the flow measure because the time-invariant difference between the rates across two groups of counties will be differenced out with the DiD approach.

Tables 5 and 6 present results with different regression specifications. The estimates suggest that the government's involvement in the mortgage through loan limits does not have net positive effects on home ownership. The increase in loan limits with T_1 does not have statistically significant effects on home ownership. Although both T_2 and T_3 have statistically significant effects in some specifications, the estimates show that a decrease in the government's involvement does not decrease home ownership. In some specifications, the decrease in the government's involvement led to an increase in home ownership.

Table 5: Effects on Changes in Home Ownership with Controls

	GSE & FHA Limits Inc.		GSE Limit Dec.		FHA Limit Dec.	
	(1)	(2)	(3)	(4)	(5)	(6)
Post=1	-.00038	-.00038	-6.1e-06	-1.8e-06	-.00012	-.00011
	(.00031)	(.00031)	(.00013)	(.00013)	(.00015)	(.00015)
Post=1 × Treated=1	-.00014*	-.00014*	-.00021*	-.00023*	-.00014	-.00017
	(.00011)	(.00011)	(.00015)	(.00016)	(.00018)	(.00018)
Large=1		.000071		.00019**		.00026***
		(.00016)		(.000082)		(.0001)
Post=1 × Large=1		-.00026		-.00018		-.00061***
		(.00023)		(.00016)		(.00018)
Treated=1 × Large=1		-.00017*		-.00035***		-.00042***
		(.00013)		(.000089)		(.00012)
Post=1 × Treated=1 × Large=1		.000018		.00044**		.00068***
		(.0002)		(.00017)		(.0002)
Other Control	Y	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y	Y
N. Obs.	87,933,776	87,933,776	112,500,320	112,500,320	138,094,112	138,094,112
Adj. R^2	0.001	0.001	0.001	0.001	0.001	0.001

Table 6: Effects on Changes in Home Ownership without Controls

	GSE & FHA Limits Inc.		GSE Limit Dec.		FHA Limit Dec.	
	(1)	(2)	(3)	(4)	(5)	(6)
Post=1	-.00017***	-.00017***	-.0003***	-.0003***	.00066***	.00066***
	(.000062)	(.000062)	(.000074)	(.000075)	(.00012)	(.00012)
Post=1 × Treated=1	-.00025**	-.00025**	-.000082	-.00012	-.00023*	-.00026*
	(.000098)	(.0001)	(.00015)	(.00015)	(.00018)	(.00018)
Large=1		-.00016*		-.000022		.000079
		(.000091)		(.000069)		(.000085)
Post=1 × Large=1		.0001		.000066		-.00059***
		(.00015)		(.00012)		(.00015)
Treated=1 × Large=1		-.0001		-.00028***		-.00049***
		(.00013)		(.000091)		(.00012)
Post=1 × Treated=1 × Large=1		-.000034		.00027*		.00079***
		(.0002)		(.00017)		(.0002)
Other Control	N	N	N	N	N	N
County FE	Y	Y	Y	Y	Y	Y
N. Obs.	87,933,776	87,933,776	112,500,320	112,500,320	138,094,112	138,094,112
Adj. R^2	0.001	0.001	0.001	0.001	0.001	0.001

7 Conclusion

The U.S. federal government guarantees a vast majority of mortgages through the government sponsored enterprises and the federal housing administration. Although the government's involvement in mortgage financing is controversial, it is often justified to make mortgage credits more available and thereby promote home ownership. However, very little is known about the effects of government mortgage guarantees on home buying and home ownership. To estimate the effects, we implement a difference-in-difference design, with detailed property-level data, that exploits regional changes in upper limits of the mortgage size that can be guaranteed by the government. We find that government guarantees did not have their intended effects on home ownership: although the guarantees had positive effects on house transactions with an increase in mortgage origination, home ownership rates did not increase.

References

Acolin, A., Bricker, J., Calem, P., Wachter, S., May 2016. Borrowing constraints and homeownership. American Economic Review 106 (5), 625–29.

Adelino, M., Schoar, A., Severino, F., 2012. Credit supply and house prices: evidence from mortgage market segmentation. Tech. rep., National Bureau of Economic Research.

Anenberg, E., Hizmo, A., Kung, E., Molloy, R., 2016. The effect of mortgage credit availability on house prices and construction: Evidence from a frontier estimation approach. Unpublished Manuscript.

Anenberg, E., Kung, E., 2017. Interest rates and housing market dynamics in a housing search model.

Bhutta, N., Ringo, D. R., et al., 2017. The effect of interest rates on home buying: Evidence from a discontinuity in mortgage insurance premiums.

DeFusco, A. A., Paciorek, A., 2017. The interest rate elasticity of mortgage demand: Evidence from bunching at the conforming loan limit. American Economic Journal: Economic Policy 9 (1), 210–240.

Elenev, V., Landvoigt, T., Van Nieuwerburgh, S., 2016. Phasing out the GSEs. Journal of Monetary Economics 81 (C), 111–132.

Fetter, D. K., 2013. How do mortgage subsidies affect home ownership? evidence from the mid-century gi bills. American Economic Journal: Economic Policy 5 (2), 111–147.

Fuster, A., Vickery, J., 2015. Securitization and the fixed-rate mortgage. Review of Financial Studies 28 (1), 176–211.

Fuster, A., Zafar, B., May 2016. To buy or not to buy: Consumer constraints in the housing market. American Economic Review 106 (5), 636–40.

Gete, P., Zecchetto, F., 2017. Distributional implications of government guarantees in mortgage markets. The Review of Financial Studies, hhx083.

Glaeser, E. L., Shapiro, J. M., 2003. The benefits of the home mortgage interest deduction. Tax policy and the economy 17, 37–82.

Goodman, L., Seidman, E., Zhu, J., 2014. Fha loan limits: What areas are the most affected? Urban Institute 11, 2017.

Hilber, C. A., Turner, T. M., 2014. The mortgage interest deduction and its impact on homeownership decisions. Review of Economics and Statistics 96 (4), 618–637.

Jeske, K., Krueger, D., Mitman, K., 2013. Housing, mortgage bailout guarantees and the macro economy. Journal of Monetary Economics 60 (8), 917–935.

Kaufman, A., 2014. The influence of fannie and freddie on mortgage loan terms. Real Estate Economics 42 (2), 472–496.

Kung, E., 2014. The effect of credit availability on house prices: Evidence from the economic stimulus act of 2008.

Passmore, S. W., Sherlund, S. M., Burgess, G., 2005. The effect of housing government-sponsored enterprises on mortgage rates.

Poterba, J. M., 1984. Tax subsidies to owner-occupied housing: An asset-market approach. The Quarterly Journal of Economics 99 (4), 729–752.

Sherlund, S. M., 2008. The jumbo-conforming spread: A semiparametric approach.

Sommer, K., Sullivan, P., forthcoming. Implications of us tax policy for house prices, rents, and homeownership. The American Economic Review.