Concentration in Mortgage Markets: GSE Exposure and Risk-Taking in Uncertain Times

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Abstract

When home prices threaten to decline, lenders bearing more of a community's mortgage risk have an incentive to combat this decline with new lending that boosts demand. We test whether this incentive drove the government-sponsored enterprises (GSEs) to guarantee riskier mortgages in early 2007, as the chance of substantial declines grew from small to significant. To identify the effect we relate new risky lending to regional variation in the GSEs' exposure, and the interaction of this variation with home-price elasticity. We focus on the GSEs' discretion across potential purchases by reference to the credit-score threshold that triggers manual underwriting. We conclude that this incentive helps explain the GSEs' expansion of risky lending shortly before the financial crisis.

Keywords: GSEs, Concentration, Risk Exposure

JEL Classifications: G01, G21, L25, R31.

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1. Introduction

To help people buy their homes, the Federal Government sponsored the Federal National Mortgage Agency (Fannie) and the Federal Home Loan Mortgage Corporation (Freddie). These government-sponsored enterprises, i.e. GSEs, fared badly in the financial crisis and entered conservatorship after the September, 2008 collapse of Lehman Brothers. They are still in conservatorship over a decade later, but they continue to play the large role they have played for decades in home finance. Currently, the GSEs guarantee over half of all new mortgages originated in the United States.[1] Over the years of conservatorship, Congress has debated the merits of sponsoring the GSEs, including the merits of the competitive advantage it imparts and the concentration this feeds. This paper contributes to that debate by asking whether the concentration increased risky lending at a pivotal moment.

This moment is the first half of 2007, and it is pivotal because it saw the likelihood placed on a significant house-price drop swing from low to significant. This swing is well-documented in incipient trends in prices and foreclosures, in rapidly widening credit-default swap, i.e. CDS spreads, and in the actions and statements by major market participants. The mortgage market transitioned over these months, with private-label participants rapidly exiting and the GSEs expanding. We document that the bulk of the GSEs' expansion was in high-LTV and low-FICO score mortgages. Considering the deteriorating outlook of the housing market, this accumulation of risk might seem surprising. Indeed, it is well-documented in hindsight that this expansion generally turned out badly, worsening the GSEs' losses as the crisis played out. This might from a distance appear to be just the GSEs mechanically filling a vacuum left by the exit of private-label securitizers and then having bad luck, and some of it may be as simple as that. But we find a more subtle dynamic at work, where the GSEs aim to foster new loans, even loans with bad prospects, to protect the value of the loans they already hold.

The GSEs entered 2007 bearing the credit risk of a large fraction of existing mortgages,

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[1]Sixty percent of those originated in 2018. In this paper, we use purchase and guarantee interchangably. The GSEs sometimes purchase loans from lenders and at other times the loans stay on the lenders' books, but the the GSEs will guarantee them and assume the credit risk.

up to 88% of conforming mortgages in some Metropolitan Statistical Areas (MSAs). Such extreme concentration can skew the incentives of a mortgage investor fearing a price drop (see Gupta 2018). A price drop threatens losses both by making strategic default more appealing and by worsening recovery in case of foreclosure, so the fear of a drop can encourage a mortgage investor to fight it off by boosting its assistance to people buying or retaining their homes. Concentration amplifies this incentive because an investor holding more of a region's mortgages internalizes more of the price effect of a new loan, and so will accept a bigger expected loss on that loan. If prices end up dropping anyhow then the bigger expectation materializes, and the economy can be worse off than it would have been without the concentration-driven lending. It is key to this incentive that the probability of a price drop be high enough to fear but not too high to fight, and that is what points our analysis at the first half of 2007, when the probability rose from small to significant. Our goal is to establish whether the concentration-driven incentive helps explain the GSEs' choices at that time. If concentration leads lenders to double down in fragile times, offering new leverage that can worsen the bad state they are trying to fight off, then this is a dynamic to bear in mind when considering the GSEs' post-conservatorship fate.

We begin our analysis by characterizing the GSEs' risk-expansion in early 2007. We find that they accelerate their acquisition of low credit-score and high loan-to-value (LTV) loans as active subprime lenders exit the market. Does this acceleration reflect their concentration, or were they simply filling the void left by the exiting lenders? To identify the role of concentration we exploit the variation of the GSEs' share of outstanding mortgages across regions, to test whether they accelerated more where they were more concentrated. The next set of tests address the efficacy of supporting prices by supporting demand. This efficacy goes up as the price elasticity of housing supply goes down, so if the GSEs' goal is to support prices, they should target regions combining high concentration with low elasticity. Accordingly, we interact concentration with elasticity, as measured by Saiz (2010), and we find that the risk expansion does indeed target this combination.

The GSEs act as if they target their purchases to support their portfolios, but can they actually target this way? Do they enjoy that discretion? For many acquisitions the GSEs have little discretion, because they automatically purchase loans whose credit metrics lie within well-defined boundaries. But discretion plays a bigger role outside these boundaries, so we analyze the GSEs' exercise of discretion by contrasting the growth of risky lending on either side of an important boundary. This boundary is a FICO score of 620, which the GSEs set as a threshold between automatic and manual underwriting, and which manifests in the distribution of originations across scores as a large downward gap to the left of 620 (see Keys, Seru, and Vig 2012). Mortgages with FICO scores of above 620 could be automatically underwritten and the underwriting standards were similar across geographies. For mortgages with FICO scores below 620, the GSEs allowed standards to vary across regions, through campaigns such as HomePossible (Freddie Mac) and MyCommunityMortgage (Fannie Mae).[2] So this gap, or more precisely, the shrinkage of this gap from 2006 to 2007, indicates the increase in the GSEs' discretionary risky purchases. We find increased discretionary purchases where the GSEs were more concentrated, especially where elasticity was low. This increase is also specific to the GSEs: we do not see it in the originators' portfolios, and it does not correlate across regions with the departure of the private-label securitizers. So we conclude that the GSEs did in fact target their purchases to support their portfolios.

The risk we document is quite different from the risks usually associated with concentration, and it might at first glance not even look like a risk. The incentive to take this risk arises from the GSEs' continued exposure to their past borrowers, i.e. to their "risk retention." While risk retention is generally seen as a good thing (and even encouraged by recent regulation), our paper demonstrates its downside. A favorable view of the dynamic we document is that the GSEs are only helping people buy and refinance, which is their primary mission, in an attempt to keep existing mortgages out of default and foreclosure, which are bad for the economy.

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[2]For some regions, differential standards were coded directly into automated underwriters so that mortgages with FICOs below 620 originated there did not have to go through manual underwriting. In other cases the manual underwriting requirements varied across regions.

But the GSEs' concentration means that this help can take the form of additional risky lending which ramps up the fragility of both the new borrowers and the economy as a whole. Indeed, we find that there was an increase in the delinquency rates of borrowers with FICO scores just below 620 relative to those with FICO scores just above 620 in MSAs in which the GSEs engaged in more discretionary lending, suggesting that the acceleration in 2007 reflected increased risk-taking. The loans made by the GSEs in 2007 ultimately fared badly, with the agencies eventually requiring governmental life-support. From a macroprudential perspective, a dynamic that makes bad states worse is unappealing. This adverse consequence of concentration is a potential consideration for the future disposition of Fannie and Freddie.

The rest of this paper is arranged as follows. Section 2. describes literature related to our paper. Section 3. gives some background on the housing market in 2007, details on the GSEs' geographic targeting and background on the theory of concentration-driven lending. Section 4. describes the data and provides summary statistics. Section 5. describes the main analysis and our results. The last section concludes.

2. Related Literature

Our analysis of the effect of the GSEs' regional concentration on risk-taking relates to the existing literature on the effect of lender size on risk-taking. The findings of Dell'Ariccia, Igan, and Laeven (2012) support the view that large lenders drove the pre-crisis decline in lending standards, and that weaker competition drove denial rates down. Similarly, Nadauld and Sherlund (2013) attribute most of the large increase in the securitization of subprime mortgages to the five largest broker/dealer banks. These findings bear out the concerns raised by the too-big-to-fail doctrine, i.e. that large lenders monetize their implicit guarantee with risk-shifting, and thus support the post-crisis regulation that addresses this concern with the higher capital standards and stricter scrutiny applied to Globally Systemically Important Banks, i.e. G-SIBs.

The connection between regional concentration and risk-taking we analyze is a potential

threat that the GSEs' large presence poses to the economy, in that it can worsen downturns. Other recent work considers other potential consequences of the GSEs for the macroeconomy. Elenev, Landvoigt, and Van Nieuwerburgh (2016) address the consequences of government mortgage guarantees for financial fragility, and both Jeske, Krueger, and Mitman (2013) and Gete and Zecchetto (2018) address the consequences of the GSEs' subsidies for household wealth.[3]

The existing literature does not connect regional concentration to home prices but it does connect lender concentration to mortgage interest rates, and mortgage interest rates to home prices. In Scharfstein and Sunderam (2014) and Fuster, Lo, and Willen (2016), we see that mortgage rates and spreads in secondary markets are affected by lender competition. The body of work connecting mortgage rates to home prices is large, including among others Poterba (1984), An and Yao (2016) Griffin and Maturana (2015), Landvoigt, Piazzesi, and Schneider (2015), Hubbard and Mayer (2009), Himmelberg, Mayer, and Sinai (2005), Mayer (2011), Khandani, Lo, and Merton (2009) and Favilukis, Ludvigson, and Nieuwerburgh (2017).

The connection we analyze takes as a premise that institutions condition their actions on their consequences for their existing portfolios. This premise gains support from the work of Favara and Giannetti (2015) studying the treatment by lenders of distressed assets in their portfolios. They find that lenders are less likely to foreclose on delinquent households in regions where they have large outstanding exposure. Thus, they act as if they internalize the likely negative externalities of the foreclosures on their portfolios in their work-outs.

3. Background

3.1. Increase in Mortgage Risk in Early 2007

Research into the financial crisis dates the market's first notable recognition of elevated risk from mortgages to the early days of 2007. This dating is by reference to the ABX-HE indices,

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[3]See Acharya, Richardson, Nieuwerburgh, and White (2011) for a comprehensive description of the history of the GSEs and their role in the housing boom and bust.

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which track the spreads and prices of asset-backed securities by vintage and by original rating. As reported in Stanton and Wallace (2009), the 2006 vintages saw their spreads jump and prices drop in early 2007. The biggest losses were on the lowest tranches with the BBB and AA tranches falling to half their value over the first half of 2007. Other tranches followed qualitatively similar paths over those months. The AAA tranche's price decline was less severe but still substantial - it declined by about 40% over 2007. Market prices therefore show mortgage risk growing from small to substantial in the first half of 2007.

As the outlook for mortgages worsened, investors and other participants scaled back. Private securitizers started cutting back on high LTV purchases, and one of the largest, New Century Financial, saw its stock price fall by half in March of 2007. Housing starts fell 33% from January to March of 2007 and the Economist reported that investors were "shunning subprime and all mortgages that seemed risky."[4]

Did the GSEs share the market's view of the growth of mortgage risk? The views expressed in their public statements trend in the same direction. In October 2006, Richard Syron, the then chairman and chief executive of Freddie Mac, was "concerned that foreclosure and loss rates are going to increase" and expressed concern about "a bumpy landing at a national level" for the housing market. He also cautioned against going further out on the "risk curve" and "betting on a turnaround in pricing."[5]

There is additional evidence that the GSEs may have believed that the first half of 2007 would be a temporary downturn. In January 2007 remarks on housing prices, Fannie Mae's chief economist put the end of the downturn at mid-year. He also stated that buying up inventories of unsold homes would lead to "price stablization."[6] Later, at mid-year, he revised his view and put the end of the downturn at the year-end instead.[7] Freddie Mac echoed similar sentiment with its chief economist predicting that "home sales and prices nationwide

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[4] "Cracks in the Facade," The Economist, 2007.

[5] "On the Record: Richard Syron," SFGate, 2006.

[6] "Housing experts look for recovery this year," Chicago Tribune (2007) .

[7] "Economists see glum future Crystal Ball looks cloudy at UNCA", Asheville Citizen - Times (2007).

will look better in the second half of 2007."[8] In January 2007, Freddie Mac told investors that it expected "near-term credit losses to rise while still remaining below longer-term historical levels." [9]

The first half of 2007 was therefore a pivotal moment for house prices and mortgage risk, as the risk of a significant drop grew from small to significant. This growth imparted substantial incentives to combat the risk by supporting extra lending that could help drive a market recovery.[10]

3.2. Exit by Private Securitizers and expansion by GSEs in Early 2007

Private securitizers began withdrawing from the market in mid-2006 as the housing market showed its first signs of slowing down, and this withdrawal accelerated in early 2007 as market risk increased. Concurrently with the exit, the GSEs expanded their acquisition of mortgages, not only of the prime mortgages they traditionally acquire but also of subprime mortgages. At Lehman's last Annual Financial Services Conference in May 2007, Freddie Mac's EVP of Investments referenced this expansion:[11]

> Today, the subprime market is experiencing maybe capital outflows...we're looking at the subprime market both as an opportunity to generate returns, but also as an opportunity to create some stability and leadership there and provide a way to continue.

The exit of private-label securitizers and the expansion of the GSEs are apparent in Figure 1, which plots the semiannual volumes of private and GSE securitization from 2005-2009. To

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[8] "Housing still sliding," Tribune Business Week (2007).

[9] See Freddie Mac's Annual 2006 Report and "Freddie Mac Provides Quarterly Market Update," PR Newswire (2007).

[10] As Gupta (2018) shows, it is not necessary to believe in a recovery to have incentives to prop-up. Even if a market downturn is persistent, a market participant with large outstanding mortgage exposure has incentives to prop-up prices. However, these incentives are indeed increasing in the future performance of high-risk mortgages made to prop-up one's outstanding portfolio. If the GSEs believed the downturn was temporary, they would therefore have even stronger incentives to prop-up prices.

[11] "Freddie Mac at Lehman Brothers 10th Annual Financial Services Conference," Fair Disclosure Wire (2007).

isolate the market share of higher-risk mortgages, we decompose the total volumes in Figure 1 into mortgages with LTV > 80%, (Figure 2 and 3), and those with LTV ≤ 80% (Figure 4). This decomposition shows that the GSEs' new push was specifically into higher-risk mortgages, as they increased their high-LTV originations three-fold while leaving alone the rate of lower-risk originations. Their low-risk acquisitions respond little to the private insurers' withdrawal, but their higher-risk acquisitions respond substantially, expanding as the private insurers contract. Figures 6 and 7 show a similar growth in 2007 of the GSEs' acquisition of loans to low-FICO borrowers, specifically those below 660.[12] So as the quote from Freddie Mac indicates, the GSEs were not just mechanically filling a vacuum, buying mortgages they would have bought before if the private insurers had not bought them instead, they were carrying out a strategy that focused on higher-risk product.

These high-LTV mortgages purchased in early 2007 performed badly ex-post for the GSEs. Figure 8 shows 12% of them 60+ days delinquent within two years.

3.3. Background on the GSEs' Ability to Exercise Geographic Discretion

This subsection reviews the GSEs' latitude to exercise geographic discretion in their loan acquisition. Each provided lenders with a computer interface, Desktop Underwriter for Fannie Mae and Loan Prospector for Freddie Mac, which automatically underwrote mortgages and evaluated their eligibility for purchase by the GSEs. The key risk factors determining a loan's eligibility for purchase generally did not vary geographically, so the GSEs would likely purchase a loan, regardless of geography, if it met these criteria.

The significance of a 620 FICO as a lower limit for this automatic approval is documented in detail by Keys et al (2010). Briefly, the GSEs stipulated in 1995 that a FICO below 620 put a mortgage in the Cautious Review Category, and Keys et al (2010) argue, and demonstrate empirically, that this and related rules of thumb cause a discrete change in the information embedded in mortgage approval as the FICO drops below 620. That paper considers the

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[12]A FICO score of 660 was a common cut-off used by the GSEs when determining the riskiness of a mortgage loan.

change in soft information, whereas we consider the change in geographic information.

The GSEs had several ways they could build geographic information into underwriting. The ones we focus on are geographically-targeted lending products they offered to borrowers with FICO scores below 620.[13] Fannie Mae communicated its targeting through its Property GeoCoder, software that helped lenders determine whether a property's location qualified it for their community lending products.[14] The GSEs changed these targets over time, including in January 2007 when Fannie Mae announced an expansion of community lending in multiple locations.[15] Borrowers could potentially qualify even with incomes 150-175% of the regional median. Moreover, the eligibility criteria for these mortgages were loaded into Desktop Underwriter, saving the lenders in targeted areas the labor cost of manual underwriting.

Among the other products gaining importance below 620 was Freddie Mac's HomePossible, which allowed LTVs of up to 100%. For this program, Freddie Mac allowed manual underwriting below 620, and accepted nontraditional credit records such as rent and utilities.[16] As with community lending products, the eligibility criteria varied by location and borrowers could qualify even with incomes up to 170% of the regional median. Loan Prospector, Freddie Mac's automated underwriting system, determined the income eligibility automatically for these mortgages. If the mortgages needed to be manually underwritten, sellers could use an online service, the "Income & Property Eligibility tool" provided by the agency to determine the income limit for a mortgage originated in a particular area.[17] Freddie Mac also promoted these mortgages by partnering with selected local credit unions and providing them "assistance and training" with "Home Possible Mortgage suite, and other low down payment mortgages designed to help low- and moderate-income borrowers."[18]

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[13]Community lending report by Fannie Mae (2007), report by the U.S. Department of Housing and Urban Development (2006).

[14]Report by the Department of Housing and Urban Development (2004).

[15]Community lending report by Fannie Mae (2007).

[16]"Look to the Past For Solutions," Washington Post (2007).

[17]Freddie Mac's Single Family Seller/Servicer Guide (2008).

[18]"Credit Unions Have More Ways to Succeed in Mortgage Lending Business," PR Newswire (2007).

For the purposes of our analysis, what is important about these programs is that they allowed the GSEs to implement and communicate relaxed standards for sub-620 mortgages in regions of their choice. This allows us to gauge the impact of these relaxations on regional mortgage originations in the contrast between the increase of originations just below 620 to the increase at 620 and above. To illustrate, we can track the impact of the targeting communicated in Fannie Mae's January 2007 announcement, which increased the number of qualifying borrowers in these specified regions: Portland, Vancouver, Beaverton, Seattle, Tacoma, Bellevue, Boston, Cambridge, Quincy, New York City, Northern New Jersey, Long Island, Dutchess, Orange, and Ulster Counties in New York and the states of California and Hawaii.[19] We focus on the impact by first narrowing the mortgages purchased by Fannie Mae down to just the loans to borrowers with FICOs between 610 and 629 in the MSAs associated with those targeted regions, then separating these into the 610-619 loans and the 620-629 loans, and finally comparing the growth of these two groups. The result is in the top panel of 11, which shows a marked increase in lending just below 620 than just above. The bottom panel of figure 11 runs the same exercise, except with loans from all the MSAs not targeted in this announcement, and it does not show such an increase, consistent with the increase in the targeted MSAs resulting from the targeting. The panels of Figure 12 are analogous, except that they address loans not sold to Fannie Mae but rather retained by the lenders in their portfolios. There is again no increase, in either panel, consistent with Fannie Mae's increase resulting from its own policy. Accordingly, we estimate the change in the GSEs' discretionary supply in a region from the change in the gap between 610-619 loans and 620-629 loans in that region.

4. Data and Summary Statistics

We use loan-level data from Black Knight McDash (henceforth referred to as McDash). These data have been used to study the determinants of mortgage default (Elul 2016), and the

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[19]Community lending report by Fannie Mae (2007).

expansion of credit during the housing boom (Adelino, Schoar, and Severino 2016). These data are provided by the servicers of the loans, and the contributors include the majority of the top servicers. We focus on first mortgages that are originated or outstanding starting from 2005, since coverage of the McDash data was not as extensive prior to that date (particularly for subprime loans), and continuing through 2008.

The McDash data cover about two thirds of all mortgage originations in these years. We restrict attention owner-occupied homes and exclude multifamily properties. The McDash data set is divided into a "static" file, with values that do not change over time, and a "dynamic" file. The static data set contains information obtained at the time of the original underwriting, such as the loan amount at origination, house value at the origination date and origination FICO score. The dynamic file is updated monthly. The most important dynamic variables for our analysis are the current principal balance and the investor type: private-securitized, Fannie Mae, Freddie Mac, portfolio, FHA.[20] Because of the time it takes a loan to go through the securitization pipeline, many mortgages are initially recorded as portfolio loans when they first appear in the data set; therefore, we define the "investor type at origination" to be that reported at six months from loan origination. We focus attention on loans purchased by Fannie Mae and Freddie Mac (referred to as "GSE") and Private securitized loans; the other investor types are combined into the single residual category. In addition, in some of our tests we also use loan-level data from the public Home Mortgage Disclosure Act (HMDA) dataset to calculate the share of GSE goals-eligible loans. Finally, we merge in the house prices index[21] at the zip code level from CoreLogic Solutions (henceforth referred to as CoreLogic), and the MSA-level housing supply measures from Saiz (2010).

Summary statistics for the key variables are collected in Tables 1, 2 and 3. Table 1 summarizes the GSEs' and private-securitized share of the mortgage market and the high-risk (high LTV, low origination FICO) composition of their portfolios at the end of 2006 at the

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[20]The FHA investor type includes FHA and VA loans, as well as other loans in GNMA securities.

[21]Using the December 2016 release.

MSA-level. Table 2 summarizes the GSEs and private-securitized share of new originations and their high-risk activity share of originations in the first half of 2007 at the MSA-level. The GSEs increased their share of high-risk mortgage activity substantially in 2007. At the end of 2006, 10% of GSE-securitized loans (purchases and refinances) consisted of mortgage loans with LTV ratios of above 80% and 15% consisted of mortgage loans with origination FICO scores of less than 660. In 2007, 30% of new GSE-securitized loans had an LTV ratio of above 80% and 21% had origination FICO scores of less than 660.

5. Main Analysis and Results

We start the analysis by testing Hypothesis 1:

Hypothesis 1: The GSEs increased risky loan purchases more in early 2007 in regions where they were more concentrated

The test uses a regression model explaining the regional increase in the GSEs' risky loan purchases with concentration and a time dummy. The model is

$$\Delta\text{High-Risk Acquisitions}_{y,t} = \alpha + \beta_1 Share_{y,t} + \beta_3 2007h1_t + \beta_4 2007h1 * Share_{y,t}$$

where $\Delta\text{High-Risk Acquisitions}_{y,t}$ is the increase in the proportion of mortgages purchased by the GSEs that had LTV>80 in MSA y between time t and $t-1$. $Share_{y,t}$ is the GSEs' share of all outstanding mortgages in MSA y at the beginning of time t, and $2007h1_t$ is a 1/0 indicator for the first half of 2007. The panel data span 2004 to 2008. The results are in column 1 of table 3.

This initial regression shows that the first half of 2007 saw the GSEs expand their purchase of high-LTV mortgages in MSAs in which they had a high outstanding share. A one percentage point increase in the outstanding share associates with a .0016 percentage point increase in the proportion of high-LTV mortgages purchases by the GSEs in the first half of 2007 relative to other periods.

The result supports the hypothesis but it could potentially reflect some other motive for the GSEs to expand risky activity in those months. For example, the GSEs may have understood the market better in areas where they were more concentrated, and/or had better relationships with lenders, and this familiarity could have focused risky lending in those areas. So to test whether the goal of the increase was in fact to support house prices, we test whether they increased more where demand has a bigger effect on prices. We summarize this as Hypothesis 2:

Hypothesis 2: The relation between the GSEs' increase in risky loan purchases and concentration is stronger in regions with lower house-price elasticity

For this purpose we use the MSA-level measures of house price elasticity from Saiz (2010). The regression model is

$$\Delta\text{High-Risk Acquisitions}_{y,t} = \alpha + \beta_1 Share_{y,t} + \beta_2 Elasticity_y + \beta_3 2007h1_t + \beta_4 2007h1 * Share_{y,t}$$

$$+ \beta_5 2007h1 * Elasticity_y + \beta_6 2007h1 * Share_{y,t} * Elasticity_y$$

where $Elasticity_y$ is the Saiz measure of elasticity in MSA y, which varies between 0 and 12, a higher value signifying a more elastic MSA. The variation of this measure across MSAs is in Figure 14, which shows a large amount of variation. According to Saiz (2010), in land-constrained cities elasticities are equal to and below 1. We therefore have a large number of elastic and inelastic MSAs in our sample.

Column 2 of table 3 reports the results of the test of Hypothesis 2. In line with the hypothesis, we find a negative and statistically significant coefficient on the interaction of the elasticity with the share and the 2007h1 time period, which means that, for a given concentration of outstanding loans, the GSEs grew high-risk purchases in early 2007 more in areas with higher sensitivity of price to demand. The coefficient on the interaction between the time period and the share is positive and significant, and at the point estimate implies that a relatively low elasticity of 1, associates a 1 percentage point increase in the GSEs'

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outstanding share with a .002 percentage point increase in the proportion of high-LTV mortgages purchases by the GSEs in the first half of 2007 relative to other periods.

The empirical use of housing supply elasticities has been critiqued, but this critique is unlikely to apply to our result. The critique by Davidoff (2015) is that the elasticities correlate with unobserved housing demand, i.e. that land-constrained and therefore lower-elasticity areas such as coastal cities are often desirable cities from a lifestyle perspective. For this critique to apply to our result, given the differencing it reflects, demand to live in land-constrained areas would have to have been higher in early 2007 than at other times, and even more so in areas where the GSEs' concentration was higher. Our test assumes that this contingency, which appears a priori unlikely, does not apply.

We run our regressions at the MSA level as the elasticities are available only at the MSA level. The actual geographic targeting could have been more granular, as for example we see in the January 2007 Fannie Mae announcement, which targets Boston, Cambridge and Quincy,[22] which are part but not all of the greater-Boston MSA. What is important for our results to hold is that an inelastic MSA comprises more inelastic census tracts, cities etc., than does an elastic MSA.

Are the GSEs really choosing these increases? Considering how many of the GSEs' purchases are non-discretionary, it is worth focusing on the discretionary component of the increase. This is our third hypothesis:

Hypothesis 3: Discretionary purchases by GSEs increase with concentration, and this is stronger when house price elasticity is lower

As discussed in Section III.C, our estimate of the discretionary component uses the contrast across a FICO of 620, in particular the change in the gap between loans to borrowers with FICOs between 610 and 619 and loans to borrowers with FICOs between 620 and 629. Specifically, the regression model is

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[22]Community lending report by Fannie Mae (2007).

$$\Delta\text{Discretionary Supply}_{y,t} = \alpha + \beta_1 GSEShare_{y,t} + \beta_2 Elasticity_y + \beta_3 2007h1_t +$$

$$\beta_4 2007h1 * GSEShare_{y,t} + \beta_5 2007h1 * Elasticity_y +$$

$$\beta_6 2007h1 * GSEShare_{y,t} * Elasticity_y$$

where $\Delta\text{Discretionary Supply}_{y,t}$ is the annual change in the number of loans purchased by the GSEs with FICOs between 610 and 619 divided by the number of loans with FICOS between 620 and 629 in MSA y at time t. The results are in table 4.

The increase in the discretionary component of the GSEs purchases lines up with the previous results. In the first half of 2007 there is more increase where there is more concentration, and where there is both more concentration and lower elasticity. The point estimates imply that in early 2007, in an MSA with a low elasticity of 1, a 1 percentage point increase in the GSEs' outstanding share associated with a .01 percentage point increase in the proportion of loans purchased by the GSEs below 620 vs above.

For a sense of how early 2007 differs from other periods, we repeat this regression with separate indicators for each half-year, and plot the coefficients on the triple difference. The result is Figure 15, which shows that early 2007 stands out as the specific time when higher concentration and lower elasticity teamed up to increase discretionary lending.

5.1. Robustness and Alternative Hypotheses

The empirical tests support the hypothesis that the GSEs expanded risky purchases in early 2007 to support the mortgages on their books. The main building blocks of this support are that 1) early 2007 was the time to do this, since the risk of a damaging price drop was big enough to fear but not too big to fight, 2) the expansion correlated across MSAs with the GSEs existing exposure, 3) the expansion was even stronger when high exposure combined with low price elasticity, and 4) discretionary purchases in particular correlate with these

incentives. But could another hypothesis explain these results? In this section we consider and test several alternate explanations.

Is this just the usual relation of risky purchases to concentration and elasticity, whether or not house prices are in danger? The tests address this concern by interacting the coefficients with the indicator for the first half of 2007. But we can also address it with a placebo test, where we replicate the test design for other half-years. In particular, instead of interacting the coefficients with the indicator for the first half of 2007, we instead interact them with an indicator for the half-year before (the second half of 2006) and the half-year after (the second half of 2007). The results of these regressions, reported in Table 9, show that early 2007 is the period where risky purchases, concentration and elasticity have this relation and differ significantly from other time-periods in the sample. So the relation we find in early 2007 is not just the usual relation.

Were the GSEs actually using their discretion to acquire better mortgages? Lower scores generally predict worse performance, but Keys et al. (2012) find an upward gap in future performance left of 620, consistent with higher intensity of useful new information incorporated in manual underwriting. It is therefore possible that the GSEs' expansion of discretionary supply was not accompanied by a decrease in underwriting standards or an increase in risk. We explore this possibility by testing whether subsequent default is greater for the discretionary mortgages of early 2007. Specifically, we calculate the difference in the annual change in default rate of loans below 620 and the annual change in the default rate of loans above 620 in each MSA. This number is higher when the default rate increased relatively more amongst loans the GSEs purchased below 620 compared to loans they purchased above 620. We find that in 2007, an increase in discretionary supply was positively correlated with an increase in this number. The results are reported in Table 5.

Is this actually the lenders expanding for their own reasons, and the GSEs just passively buying the product? Our main tests address this possibility by relating the expansion specifically to the GSEs' incentives, as quantified by the concentrations and elasticities, and

by focusing on the GSEs' discretionary purchases by exploiting the contrast across 620. Another way to address the possibility that the GSEs are just passive is to ask if the lenders' MSA-level acquisitions follow the same pattern as that of the GSEs around the 620 FICO threshold. We can run this test because the data show when a new loan is retained by the lender rather than sold to a GSE. Accordingly, we repeat the regression explaining the increase in discretionary purchases, only with the GSEs' purchases replaced by the lenders' retentions. The results, in Table 6, find nothing. So the growth in below-620 vs 620+ lending is specific to the GSEs, bearing out the hypothesis that it results from their incentives and their active decisions.

Is this just the GSEs filling the voids left by the departing private securitizers? Our main tests address this possibility by tying the GSEs' expansion to the GSEs' incentives. But if the GSEs' incentives happen to correlate across MSAs' with the voids left by the exit of private securitizers, then maybe this is really the voids at work. We can test this hypothesis because we can quantify the voids, i.e. the decreases in the MSAs of purchases by private securitizers. We run the test by again repeating the regression explaining the increase in discretionary purchases, this time with the explanatory variables replaced by these decreases. The results, in Table 7, show no significant relation. So we conclude that this is not just the GSEs replacing the private securitizers.

Is this the GSEs serving their housing goals, rather than defending their existing holdings? Congress sets housing goals for the GSEs. The GSEs don't see much consequence from falling short of these goals (Acharya et al. 2011) but the goals could drive the GSEs purchases, including in early 2007. If the goals correlate across MSAs with the existing holdings, they could deliver our results. We can test this directly because the goals are publicly reported. So we test this hypothesis by repeating once more the regressing explaining the increase in discretionary purchases, except now the explanatory variables are replaced by the MSA-level change in goals. The results are in Table 8, where in column 1 the explanatory variable is the change in the number of loans in the MSA that count toward the GSEs' goals, while

in column 2 the number of eligible loans is multiplied by the average number of goals that a loan in the MSA counts towards. In particular, the second regression accounts for the possibility of serving several goals with one loan. With or without adjustment, the change in the goals does not relate significantly to the change in discretionary lending. So our results do not appear to be driven by the goals.

Were the GSEs just gambling for resurrection? The hypothesis we test has a close relation in the standard risk-shifting hypothesis. In our hypothesis, the GSEs trade the benefit of reducing the probability of a bad state against the cost of a worse bad state if it happens anyhow. In the standard risk-shifting model, a firm takes the probabilities as given, and trades the benefit of doing better in the solvency state against the cost of being more insolvent in the insolvency state. Both hypotheses can explain the GSEs buying more loans where they already had more, in the first case because it supports the portfolio more, and the second case because it undiversifies the portfolio more. But only our hypothesis ties the new purchases to the combination of concentration and low elasticity. The low elasticity delivers the immediate price support that defends against the bad state.

6. Conclusion

In this paper, we provide evidence that concentration in mortgage markets can affect the quality of credit. We test the hypothesis that institutions with a large outstanding exposure to the mortgage market have incentives to extend risky credit to prop up house prices. To discern the effect that different levels of mortgage market exposure can have on the quality of credit, we exploit variation in the size of the GSEs' exposure across MSAs.

We find that in 2007 when the housing boom ended and house prices started falling, the GSEs increased high-risk mortgage activity in MSAs in which they had large outstanding exposure to the mortgage market. We perform a number of tests to discern whether this relationship is driven by incentives to keep house prices high and find evidence in line with our hypothesis. In particular we find the effect of outstanding share on high-risk activity is

stronger in MSAs in which housing supply is relatively inelastic as it is in these MSAs that we expect credit expansion to have a strong effect on house prices. Furthermore, we also find that this effect is stronger when default rates are more sensitive to house prices. We also provide evidence that the GSEs' standards worsened in MSAs in which the GSEs had a larger outstanding share.

Our paper has implications for the design on the housing market. We show that incentives to lend differ between large versus small mortgage market participants. In the aftermath of the financial crisis, policy makers have wanted to design policy measures that curb high-risk lending. Concentration in mortgage markets has been largely overlooked. In 2016, The Economist reported that markets are more concentrated now than they were during the housing boom and bust. Government organizations are funding about 65-80% of new mortgages and Quicken Loans and Freedom Mortgage are currently originating about half of all new mortgages. Many of these new mortgages appear to be highly risky with 20% of them having LTV ratios of over 95%. We hope to contribute to the macro-prudential policy discussion on how to curb high-risk lending through this paper.

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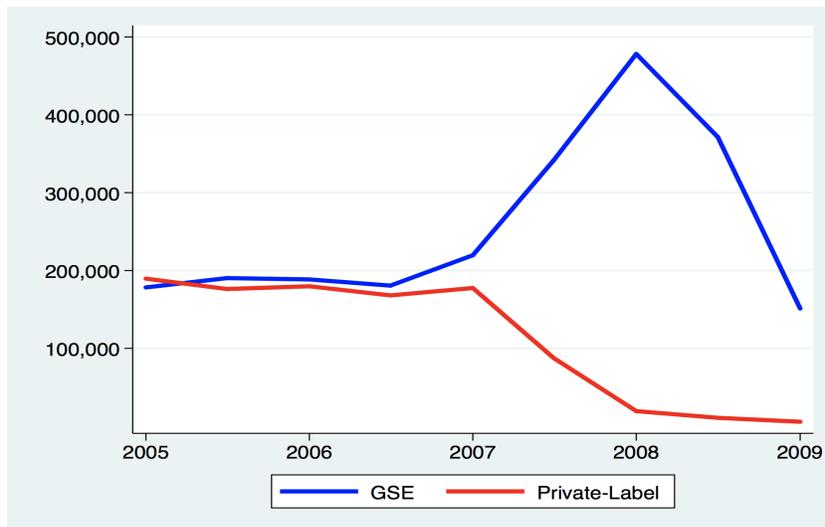
7. Figures and Tables

Figure 1: GSEs' and Private-Label Activity
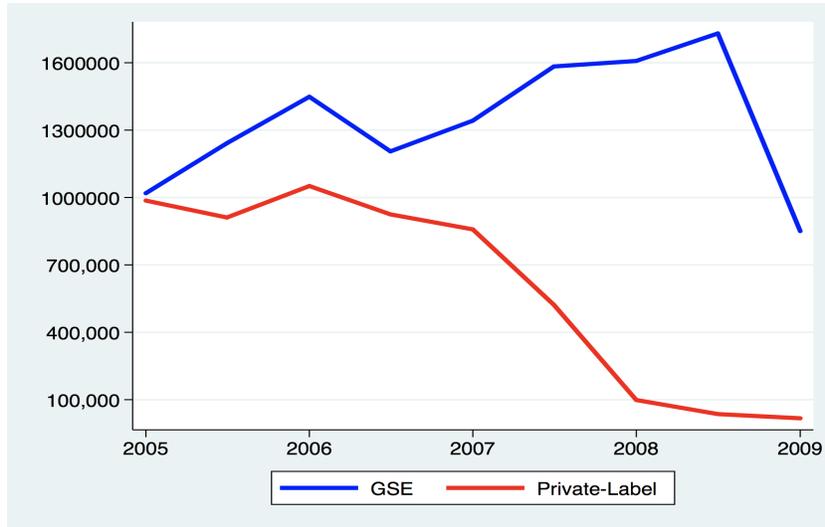
The figure above plots the number of loans that were purchased by the GSEs and private-label securitizers from 2005 to 2009.
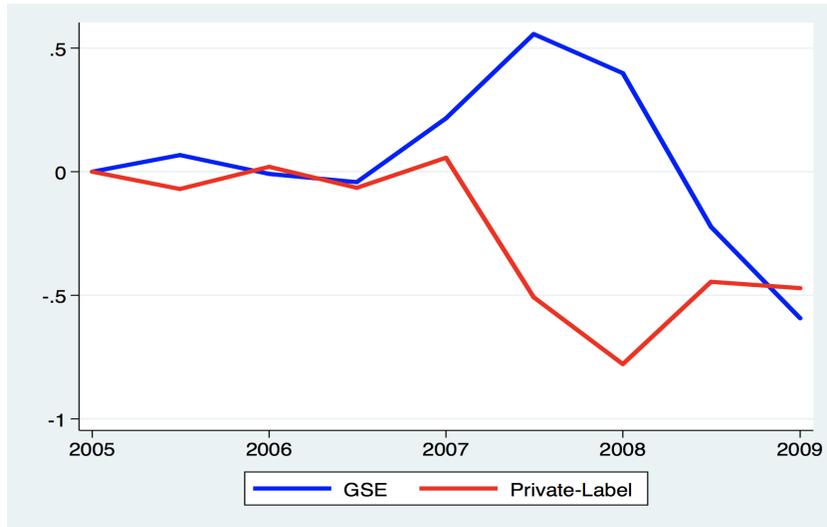Data is semi-annual. Source: McDash.

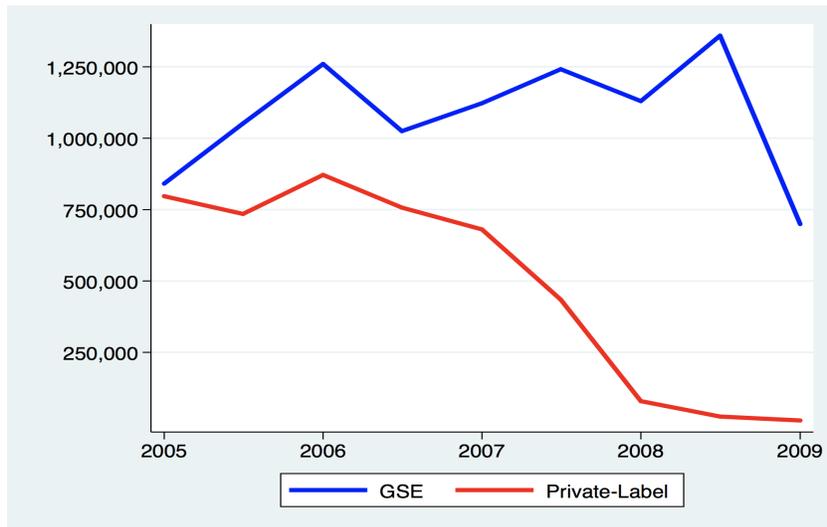**Figure 2**: GSEs' and Private-Label High-Risk Activity

The figure above plots the number of high LTV loans, LTV > 80 at origination, that were purchased by the GSEs and
private-label securitizers from 2005 to 2009. Data is semi-annual. Source: McDash.

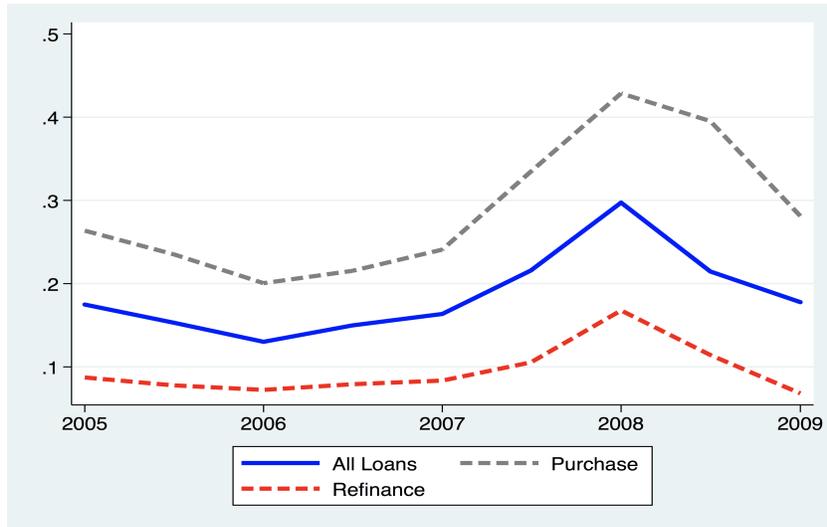**Figure 3**: GSEs' and Private-Label Growth in High-Risk Activity

The figure above plots the growth in the number of high LTV loans, LTV > 80 at origination, that were purchased by the GSEs and private-label securitizers from 2005 to 2009. Data is semi-annual. Source: McDash.

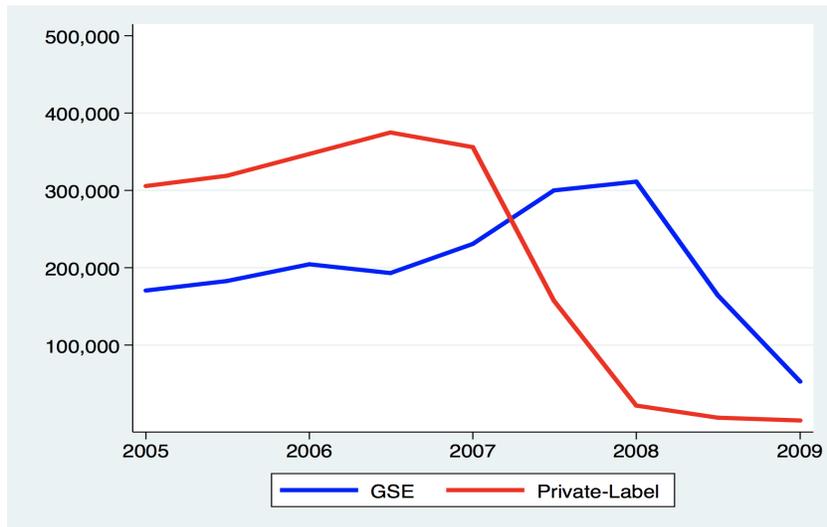**Figure 4**: GSEs' and Private-Label Low-Risk Activity

The figure above plots the number of low LTV loans, LTV ≤ 80 at origination, that were purchased by the GSEs and private-label securitizers from 2005 to 2009. Data is semi-annual. Source: McDash.

Figure 5: GSEs' High-Risk Fraction of New Guarantees

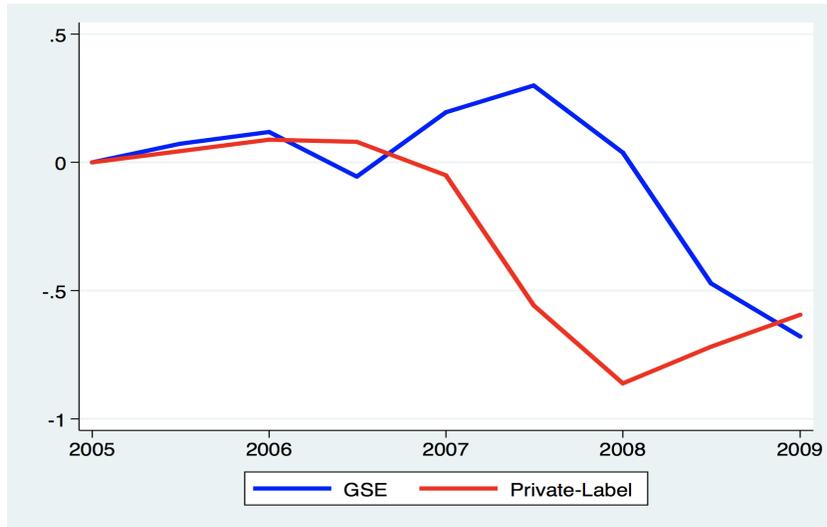The figure above plots the proportion of high LTV purchased, LTV > 80 at origination, as a fraction of total purchases by the GSEs from 2005 to 2009. Data is semi-annual. Source: McDash.

**Figure 6**: GSEs' and Private-Label Low FICO Activity

The figure above plots the number of low FICO loans, FICO < 660, that were purchased by the GSEs and private-label securitizers from 2005 to 2009. Data is semi-annual. Source: McDash.

Figure 7: GSEs' and Private-Label Growth in Low FICO Activity

The figure above plots the growth in the number of low FICO loans, FICO < 660 at origination, that were purchased by the GSEs and private-label securitizers from 2005 to 2009. Data is semi-annual. Source: McDash.

Figure 8: GSEs' Delinquency Rates by LTV
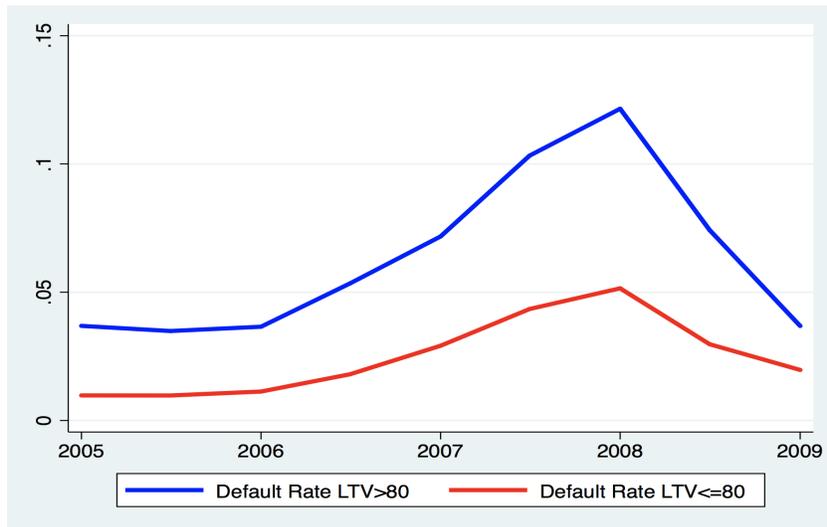
The figure above plots the proportion of the GSEs' mortgages that were 60+ day delinquent within two years of origination 2005 to 2009, broken up by LTV buckets. The x-axis is the quarter of origination. Source: McDash.

Figure 9: GSEs' Delinquency Rates by FICO
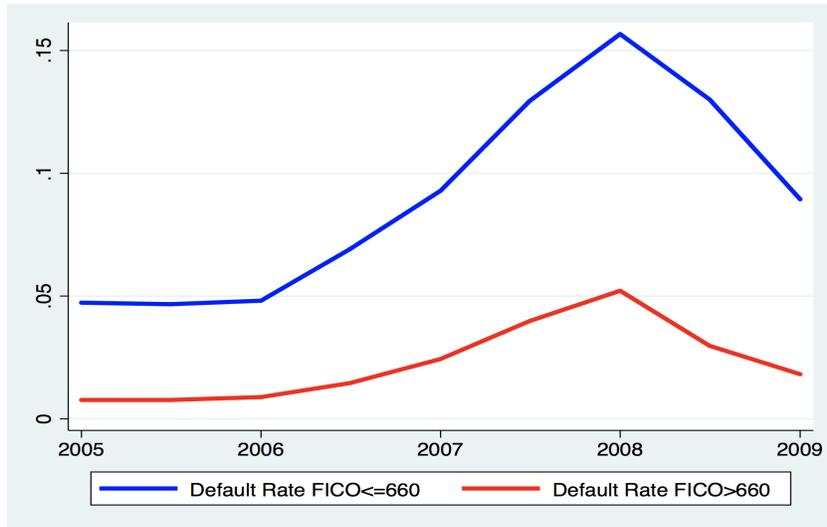
The figure above plots the proportion of the GSEs' mortgages that were 60+ day delinquent within two years of origination 2005 to 2009, broken up by FICO buckets. The x-axis is the quarter of origination. Source: McDash.

Figure 10: Map of the GSEs' Outstanding Share by MSA
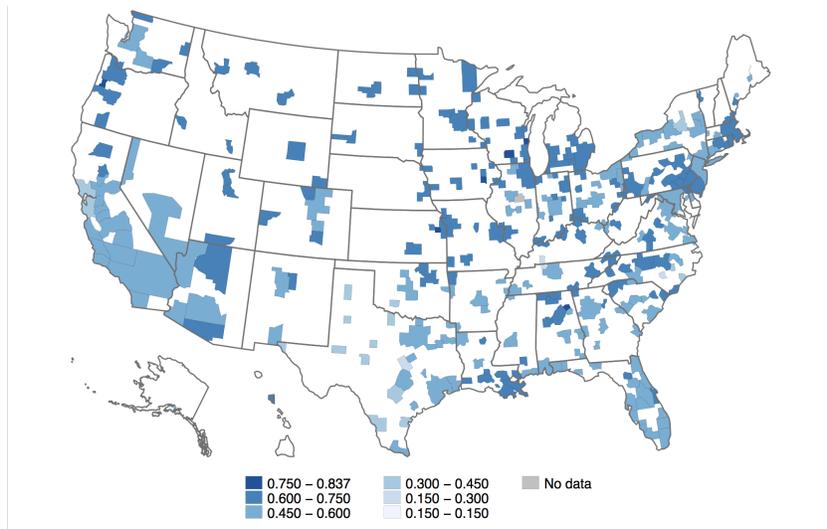
The map above shows the variation in the GSEs' outstanding share of non-jumbo mortgages across MSAs at the start of 2007. The darker colors represent the MSAs in which the GSEs had a larger share. Source: McDash.

Figure 11: Fannie Mae's Acquisitons in Response to a Relaxation of Community Lending Standards
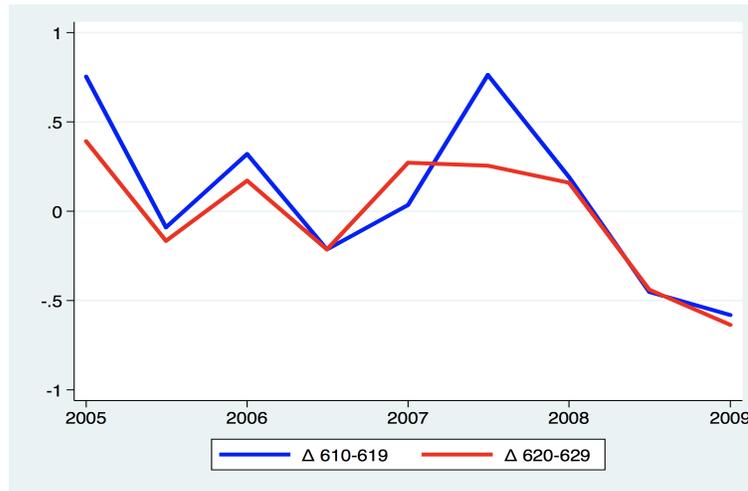
(a) MSAs in which standards were relaxed
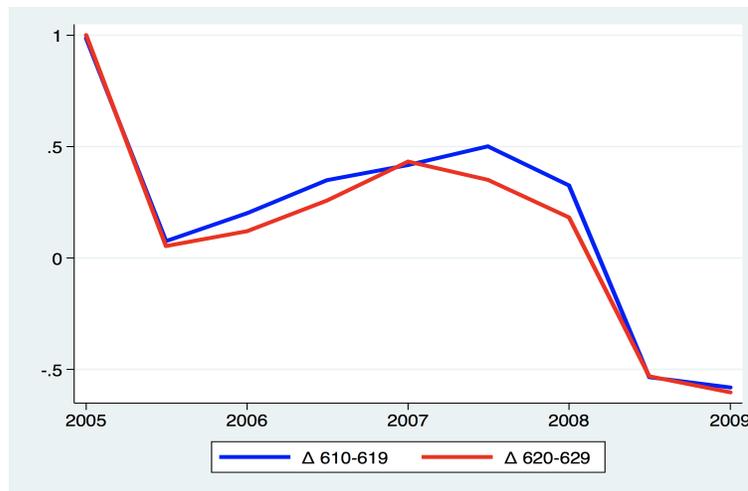
(b) MSAs in which there was no change in standards

The figures above plot the growth in Fannie Mae's acqisitons of loans with FICO scores between 610-619 and between 620-629 in MSAs in which community lending standards were relaxed in 2007 (top panel) and in which there was no change in standards (bottom panel). Source: McDash.

Figure 12: Portfolio Loans Response to a Relaxation of Community Lending Standards
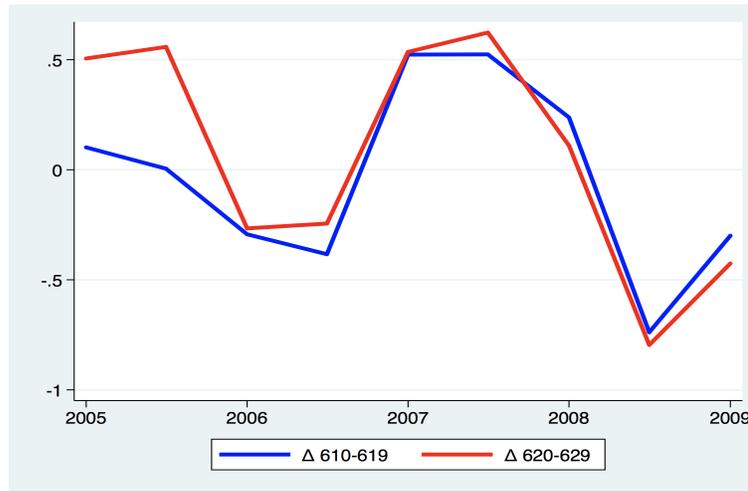
(a) MSAs in which standards were relaxed. Source: McDash.
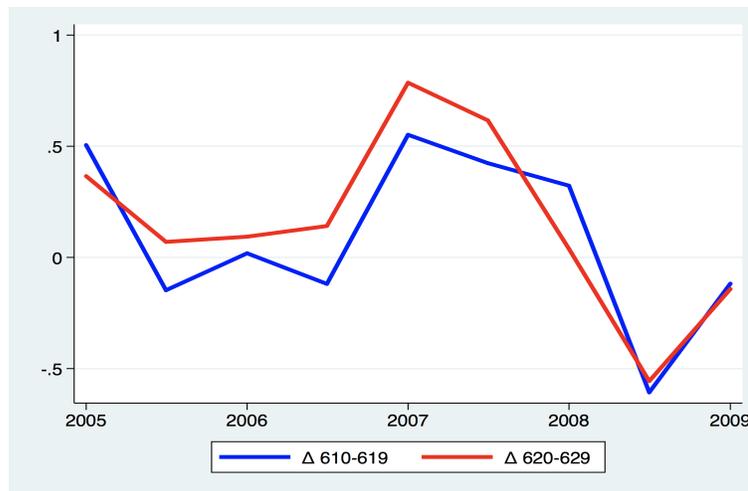
(b) MSAs in which there was no change in standards.

The figures above plots the growth in the loans held on portfolio (not securitized) by lenders with FICO scores between 610-619 and between 620-629 in MSAs in which community lending standards were relaxed in 2007 (top panel) and in which there was no change in standards (bottom panel). Source: McDash.

Figure 13: Variation in the GSEs' Outstanding Share by MSA
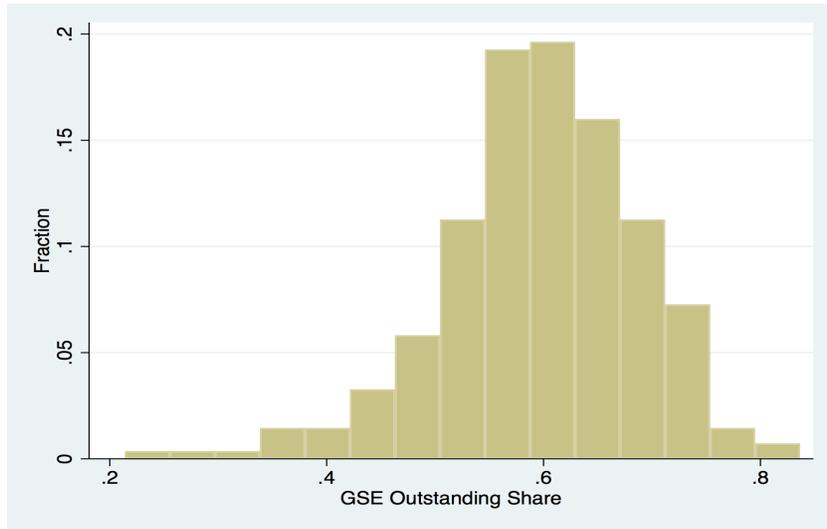
The histogram above shows the variation in the GSEs' outstanding share of non-jumbo mortgages across MSAs at the start of 2007. Source: McDash.

Figure 14: Variation in Housing Supply Elasticities by MSA
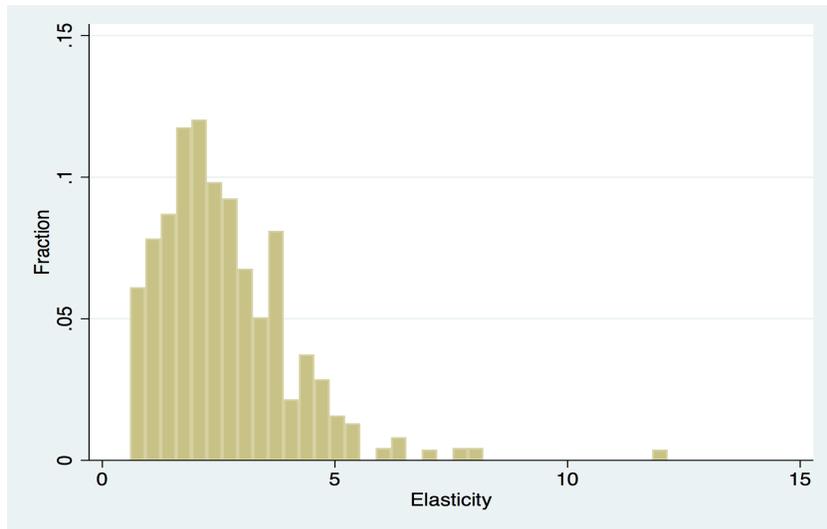
The histogram above shows the variation in housing supply elasticities taken from Saiz (2010). Source: McDash.

Table 1: **Summary Statistics: GSEs' and Private-Label Mortgages Outstanding at start of 2007**

	Mean	Standard Deviation	Min	Max
MSA-Level Mortgage Market Statistics				
GSEs' Share of Mortgage Market	.63	.10	.25	.88
Private Share of Mortgage Market	.16	.06	.06	.41
Average Updated LTV across MSA	.58	.06	.43	.71
High Updated LTV ($> 80\%$) Fraction	.17	.08	.03	.39
Low Origination FICO (< 660) Fraction	.25	.08	.03	.49
GSE				
Average Updated LTV across MSA	.54	.07	.31	.68
High Updated LTV ($> 80\%$) Fraction	.10	.05	.02	.29
Low Origination FICO (< 660) Fraction	.15	.05	.05	.28
Private-Label				
Average Updated LTV across MSA	.67	.05	.45	.79
High Updated LTV ($> 80\%$) Fraction	.24	.11	.04	.59
Low Origination FICO (< 660) Fraction	.45	.13	.11	.72

Source: McDash and CoreLogic

Table 2: **Summary Statistics: GSEs' and Private-Label Originations in first half of 2007**

	Mean	Standard Deviation	Min	Max
MSA-Level Mortgage Market Statistics				
GSEs' Share of Mortgage Market	.65	.09	.28	.87
Private Share of Mortgage Market	.16	.08	.05	.52
High LTV ($> 80\%$) Fraction	.40	.13	.07	.69
Low Origination FICO (< 660) Fraction	.33	.08	.11	.57
GSE				
High LTV ($> 80\%$) Fraction	.30	.12	.02	.60
Low Origination FICO (< 660) Fraction	.21	.07	.06	.49
Private-Label				
High LTV ($> 80\%$) Fraction	.35	.14	.03	.77
Low Origination FICO (< 660) Fraction	.47	.15	.08	.85

Source: McDash

Table 3: Change in High-Risk Acquisitions

	(1)	(2)
GSE Outstanding Share	-0.111***	-0.147***
	(-8.35)	(-5.81)
Elasticity		-0.015*
		(-1.94)
2007h1	-0.039*	-0.160***
	(-1.67)	(-3.69)
2007h1 × GSE Outstanding Share	0.158***	0.327***
	(4.18)	(4.62)
2007h1 × Elasticity		0.082***
		(3.75)
GSE Outstanding Share × Elasticity × 2007h1		-0.115***
		(-3.31)
GSE Outstanding Share × Elasticity		0.023*
		(1.88)
R2	0.158	0.169
N	2750	2340

The Table reports the estimated coefficients of the following regression:

$$\Delta\text{High-Risk Acquisitions}_{y,t} = \alpha + \beta_1 Share_{y,t} + \beta_2 Elasticity_y + \beta_3 2007h1_t + \beta_4 2007h1 * Share_{y,t}$$

$$+ \beta_5 2007h1 * Elasticity_y + \beta_6 2007h1 * Share_{y,t} * Elasticity_y$$

$\Delta\text{High-Risk Acquisitions}_{y,t}$ is the change in the proportion of mortgages purchased by the GSEs that had LTV>80 in MSA y at time t. $Share_{y,t}$ is the GSEs' share of all outstanding mortgages in MSA y at the beginning of time t. $Elasticity_y$ is the Saiz measure of elasticity in MSA y. $2007h1_t$ is an indicator that takes value 1 if t equals the first half of 2007. The panel data is semi-annual and spans from 2004 to 2008. ***, **, and * indicate significance at the 1%, 5%, and 10% level. T-statistics are shown in brackets. Source: McDash and Saiz (2010).

Figure 15: Dynamic Regressions: Change in Discretionary Supply

The figures below plot the estimated coefficients of the following regression:

$$\Delta\text{discretionary supply}_{y,t} = \alpha + GSEShare_{MSA,t} + Elasticity_{MSA} + GSEShare_{MSA,t} * Elasticity_{MSA} + \sum_t \delta_t +$$

$$\sum_t \delta_t * GSEShare_{MSA,t} + \sum_t \delta_t * Elasticity_{MSA} + \sum_t \delta_t * GSEShare_{MSA,t} * Elasticity_{MSA}$$

$\Delta\text{discretionary supply}_{y,t}$ is the annual change in the proportion of loans purchased by the GSEs below 620 to the loans above 620 in MSA y at time t. $GSEShare_{y,t}$ is the GSEs' share of all outstanding mortgages in MSA y at the beginning of time t. $Elasticity_y$ is the Saiz measure of elasticity in MSA y. $2007h1_t$ is an indicator that takes value 1 if t equals the first half of 2007. The panel data is semi-annual and spans from 2004 to 2008. The error bars around the markers represent 90% confidence intervals around the estimates. Source: McDash and Saiz (2010).
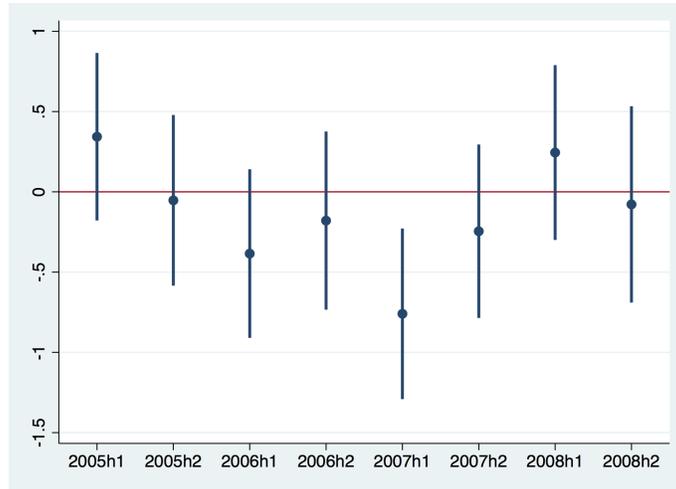
(a) Plot of coefficients on term $\delta_t * GSEShare_{MSA,t} * Elasticity_{MSA}$
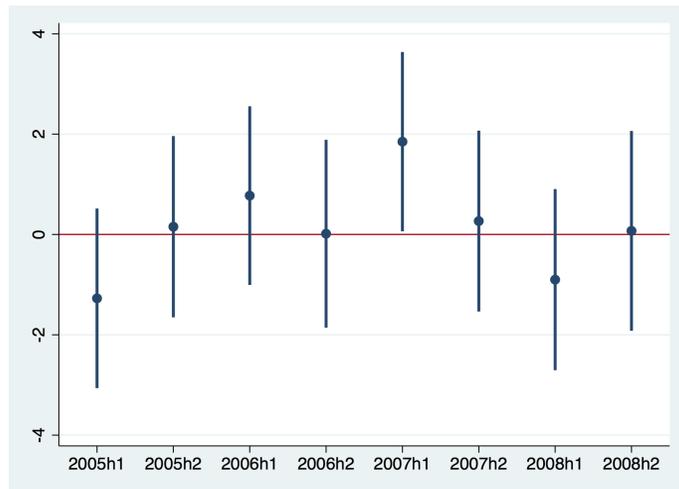
(b) Plot of coefficient on term $\delta_t * GSEShare_{MSA,t}$

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Table 4: Change in Discretionary Supply

	(1)
GSE Outstanding Share	-0.042
	(-0.16)
Elasticity	-0.049
	(-0.97)
2007h1	-1.136**
	(-2.24)
2007h1 $\times$ GSE Outstanding Share	1.746**
	(2.18)
2007h1 $\times$ Elasticity	0.425***
	(2.84)
GSE Outstanding Share $\times$ Elasticity $\times$ 2007h1	-0.627***
	(-2.66)
GSE Outstanding Share $\times$ Elasticity	0.070
	(0.89)
R2	0.006
N	2089

The Table reports the estimated coefficients of the following regression:

$$\Delta \text{discretionary supply}_{y,t} = \alpha + \beta_1 GSEShare_{y,t} + \beta_2 Elasticity_y + \beta_3 2007h1_t + \beta_4 2007h1 * GSEShare_{y,t}$$

$$+ \beta_5 2007h1 * Elasticity_y + \beta_6 2007h1 * GSEShare_{y,t} * Elasticity_y$$

$\Delta \text{discretionary supply}_{y,t}$ is the annual change in the proportion of loans purchased by the GSEs below 620 to the loans above 620 in MSA y at time t. $GSEShare_{y,t}$ is the GSEs' share of all outstanding mortgages in MSA y at the beginning of time t. $Elasticity_y$ is the Saiz measure of elasticity in MSA y. $2007h1_t$ is an indicator that takes value 1 if t equals the first half of 2007. The panel data is semi-annual and spans from 2004 to 2008. ***, **, and * indicate significance at the 1%, 5%, and 10% level. T-statistics are shown in brackets.

Table 5: **Ex-Post Performance**

	(1)
Δ Discretionary Lending	0.009
	(0.45)
2007h1	0.009
	(0.37)
Δ Discretionary Lending $\times$ 2007h1	0.125**
	(2.04)
R2	0.003
N	2053

The Table reports the estimated coefficients of the following regression:

$$\Delta \text{Default Gap}_{y,t} = \alpha + \beta_1 \Delta \text{discretionary supply}_{y,t} + \beta_2 2007h1_t + \beta_3 2007h1 * \Delta \text{discretionary supply}_{y,t}$$

ΔDefault Gap$_{y,t}$ is the difference in the annual change in default rate of the GSEs' loans below 620 minus the annual change in default rate of the GSEs' loans above 620 in MSA y at time t. Δdiscretionary supply$_{y,t}$ is the annual change in the proportion of loans purchased by the GSEs below 620 to the loans above 620 in MSA y at time t. $2007h1_t$ is an indicator that takes value 1 if t equals the first half of 2007. The panel data is semi-annual and spans from 2004 to 2008. ***, **, and * indicate significance at the 1%, 5%, and 10% level. T-statistics are shown in brackets. Source: McDash.

Table 6: Portfolio Lending Around 620 Origination FICO

	(1)
GSE Outstanding Share	1.103
	(1.64)
Elasticity	0.209
	(1.50)
2007h1	0.734
	(0.62)
2007h1 $\times$ GSE Outstanding Share	-1.465
	(-0.78)
2007h1 $\times$ Elasticity	-0.247
	(-0.65)
GSE Outstanding Share $\times$ Elasticity $\times$ 2007h1	0.451
	(0.75)
GSE Outstanding Share $\times$ Elasticity	-0.330
	(-1.52)
R2	0.003
N	1681

The Table reports the estimated coefficients of the following regression:

$$\Delta\text{discretionary supply Portfolio}_{y,t} = \alpha + \beta_1 GSEShare_{y,t} + \beta_2 Elasticity_y + \beta_3 2007h1_t + \beta_4 2007h1 * GSEShare_{y,t}$$

$$+ \beta_5 2007h1 * Elasticity_y + \beta_6 2007h1 * GSEShare_{y,t} * Elasticity_y$$

Δdiscretionary supply Portfolio$_{y,t}$ is the annual change in the proportion of loans below 620 to the loans above 620 made by lenders and held on portfolio in MSA y at time t. Source: McDash and Saiz (2010).

Table 7: Discretionary Lending and Private Label Share

	(1)
2007h1	-0.053
	(-0.78)
Change in Private Label Share	-0.681**
	(-2.10)
Change in Private Label Share $\times$ 2007h1	2.364
	(0.86)
R2	0.003
N	1883

The Table reports the estimated coefficients of the following regression:

$$\Delta \text{discretionary supply}_{y,t} = \alpha + \beta_1 \Delta PrivateShare_{y,t} + \beta_2 2007h1_t + \beta_3 2007h1 * \Delta PrivateShare_{y,t}$$

$\Delta \text{discretionary supply}_{y,t}$ is the annual change in the proportion of loans below 620 to the loans above 620 purchased by the GSEs in MSA y at time t. $2007h1_t$ is an indicator that takes value 1 if t equals the first half of 2007. $\Delta PrivateShare_{y,t}$ is the change in the private-label market's share of all outstanding mortgages between $t-1$ and t. The panel data is semi-annual and spans from 2004 to 2008. ***, **, and * indicate significance at the 1%, 5%, and 10% level. T-statistics are shown in brackets. Source: McDash (2010).

Table 8: Discretionary Lending and Growth in Agency Goals

	(1)	(2)
Growth in Goals	-0.001	
	(-0.01)	
Adjusted Growth in Goals		0.022
		(0.35)
2007h1	0.039	0.013
	(0.74)	(0.28)
Growth in Goals × 2007h1	-0.117	
	(-0.72)	
2007h1 × Adjusted Growth in Goals		-0.047
		(-0.44)
R2	0.001	0.000
N	816	816

The Table reports the estimated coefficients of the following regression:

$$\Delta\text{Discretionary Supply}_{y,t} = \alpha + \beta_1 \Delta\text{Goals}_{y,t} + \beta_2 2007h1_t + \beta_3 2007h1 * \Delta\text{Goals}$$

Δdiscretionary supply$_{y,t}$ is the annual change in the proportion of loans purchased by the GSEs below 620 to the loans above 620 in MSA y at time t. ΔGoals$_{y,t}$ is the annual growth in the number of loans eligible for the GSEs' goals in MSA y at the beginning of time t. $2007h1_t$ is an indicator that takes value 1 if t equals the first half of 2007. The panel data is semi-annual and spans from 2004 to 2008. ***, **, and * indicate significance at the 1%, 5%, and 10% level. T-statistics are shown in brackets. Column (1) reports the results when ΔGoals is measured by the growth in the number of goals eligible towards the GSEs' goals. Column (2) reports the results reports the results when ΔGoals is adjusted to also account for how much the average loan in MSA y counted towards the GSEs' goals. Source: McDash and HMDA.

Table 9: Placebo Tests - Alternative Years

	(1)	(2)
GSE Outstanding Share	0.083	0.181
	(0.31)	(0.68)
Elasticity	-0.016	0.001
	(-0.32)	(0.01)
GSE Outstanding Share × Elasticity	0.027	0.000
	(0.35)	(0.01)
2006h2	-0.283	
	(-0.55)	
2006h2 × GSE Outstanding Share	0.545	
	(0.68)	
2006h2 × Elasticity	0.113	
	(0.76)	
GSE Outstanding Share × Elasticity × 2006h2	-0.209	
	(-0.90)	
2007h2		0.168
		(0.33)
2007h2 × GSE Outstanding Share		-0.060
		(-0.07)
2007h2 × Elasticity		0.010
		(0.06)
GSE Outstanding Share × Elasticity × 2007h2		-0.043
		(-0.18)
R2	0.002	0.004
N	2089	2089

The Table reports the estimated coefficients of the following regression:

$$\Delta \text{discretionary supply}_{y,t} = \alpha + \beta_1 GSEShare_{y,t} + \beta_2 Elasticity_y + \beta_3 Placebo_t + \beta_4 Placebo_t * GSEShare_{y,t}$$

$$+ \beta_5 Placebo * Elasticity_y + \beta_6 Placebo_t * GSEShare_{y,t} * Elasticity_y$$

$\Delta \text{discretionary supply}_{y,t}$ is the annual change in the proportion of loans purchased by the GSEs below 620 to the loans above 620 in MSA y at time t. $GSEShare_{y,t}$ is the GSEs' share of all outstanding mortgages in MSA y at the beginning of time t. $Elasticity_y$ is the Saiz measure of elasticity in MSA y. $Placebo_t$ is an indicator that takes value 1 if t equals the placebo time. The panel data is semi-annual and spans from 2004 to 2008. ***, **, and * indicate significance at the 1%, 5%, and 10% level. T-statistics are shown in brackets. Source: McDash and Saiz (2010).