The Effects of Relaxing Downpayment Constraint on the Mortgage and Housing Market

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Abstract

This paper studies the effects of relaxing downpayment constraint on mortgage originations and house prices, using a geographic eligibility cutoff in a low-downpayment program introduced in United States by GSEs. A regression discontinuity design shows that relaxing downpayment constraint increased the share of high loan-to-value (LTV) mortgages by 8.2%, high LTV originations per capita by 10.5%, and house price growth by 12.7%. The effect on high LTV originations followed a bell-shaped relationship with the price-to-rent ratio, peaking in moderately priced housing markets and weakening in both low and high-cost areas. Price effects were weakest in areas with very high owned–rental market integration, due to substitution away from investor buyers whose rental demand is affected. These findings highlight how borrower characteristics, housing affordability, and housing-rental market integration shape the effects of mortgage policy interventions.

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1 Introduction

Access to mortgage credit is a key determinant of homeownership, and down payment constraints remain one of the most significant barriers, particularly for first-time buyers. Mortgage financing in the United States generally requires a minimum cash contribution from the borrower at the time of closing. This down payment requirement can act as a hard constraint, preventing otherwise creditworthy households from purchasing homes simply because they cannot meet the upfront costs (Ben-David, 2011). Reducing payment requirements can expand mortgage access, potentially increasing housing demand and driving up house prices. In this paper, I examine the effects of easing down payment constraints on mortgage originations and house prices. I further investigate the heterogeneity of the policy's impact across borrower characteristics, housing affordability, and housing market integration.

I leverage the design of two low down payment mortgage programs, HomeReady (HR) and Home Possible (HP) introduced by Fannie Mae and Freddie Mac in 2016, which feature a geographic eligibility threshold that enables a natural experimental research design. These programs were launched with the explicit objective of facilitating homeownership among low- and moderate-income borrowers. Importantly, HR and HP shared identical program designs and eligibility criteria, providing a unified national policy change that serves as a useful quasi-experimental setting for empirical analysis.

A key feature of these programs is their reduction of upfront borrowing costs. They waived or capped loan-level price adjustments (LLPAs), which are risk-based guarantee fees typically charged upfront by Fannie Mae and Freddie Mac to lenders, and passed on to borrowers (Bartlett et al., 2022). These fees can increase upfront costs, especially for high loan-to-value (LTV) borrowers, because lenders are reluctant to roll them into the loan amount without exceeding the maximum allowable LTV (typically 97%). Hence, many high-LTV borrowers are forced to pay a substantial portion of LLPAs out of pocket at closing. By waiving or capping LLPAs and reducing mortgage

insurance coverage requirements, the HR and HP programs effectively lowered the minimum cash required to close, thereby easing the down payment constraint.

HR and HP programs included a unique eligibility rule where borrower income typically had to fall below 100% of area median income (AMI). However, this income limit was waived in low-income census tracts, defined as tracts where median income is below 80% of AMI. Thus, any borrower purchasing a home in a low-income tract was eligible for HR or HP regardless of income. This creates a sharp geographic a discontinuity in program eligibility, allowing for identification of causal effects of easing downpayment constraint using a regression discontinuity design (RDD).

These programs were initiated in 2016 and expanded nationally by 2017. Participation increased rapidly, with HomeReady loans reaching nearly 18% of all Fannie Mae originations by 2019Q1. However, in mid-2019, the income limit exemptions for low-income census tracts were removed, leading to a decline in program uptake. Thus, the period from 2017 to 2018 provides a clean window to evaluate the effects of down payment policy on mortgage originations and house price. This paper combines loan-level data from the FHFA, Fannie Mae, Freddie Mac, and HMDA with tract-level socioeconomic and housing data from the American Community Survey (ACS) and house price data from FHFA House Price Index (HPI).

I exploit the eligibility thresholds built into the HR and HP programs. Tracts with median income below 80% of AMI experienced full borrower eligibility for the programs, while those above 80% of AMI retained eligibility only for borrowers with income under 100% of AMI. This institutional feature generates a discontinuity in the share of eligible borrowers that can be credibly exploited using a sharp regression discontinuity design (RDD). My primary specification focuses on tract-level outcomes, such as high LTV mortgage originations and house price growth, as these are measured at the geographic level.

The running variable in the RDD is the tract-to-area income (TAI) ratio, and the cutoff is fixed at 0.80. Tracts just below the cutoff are considered treated, while those just above serve as control tract. I implement a local linear regression within a data-

driven bandwidth and include MSA fixed effects and a set of tract-level covariates to control for observable neighbourhood differences. To validate the RDD design, I conduct several robustness checks. I confirm that observable tract characteristics that could affect mortgage originations, such as employment rates, educational attainment, share of young borrowers, housing vacancy rates are smooth across the threshold. I also verify that other mortgage credit characteristics, such as interest rates, debt-to-income (DTI) ratios, and borrower credit scores, are continuous at the cutoff. Furthermore, I rule out confounding effects from concurrent policies such as the Community Reinvestment Act (CRA) and FHFA housing goals, which also use the 80% AMI threshold (Bhutta, 2011; Saadi, 2020; Ringo, 2023; Avery and Brevoort, 2015).

I begin by analysing how reduction of downpayment requirement influences the composition of mortgage originations, particularly the origination of high loan-to-value (LTV) loans. High-LTV mortgages, defined here as loans with LTV ratios above 95% are especially responsive to lower upfront cash requirements. Using detailed loan-level data from FHFA, I document a statistically significant and economically meaningful increase in share of high-LTV originations by 8.2% in census tracts just below the income eligibility threshold. To account for heterogeneity in tract size, I normalize high-LTV originations by various demographic metrics, including population, household count, and adult population. Across all specifications, treated tracts exhibit 8-11% increase in high-LTV mortgage originations compared to control tracts, indicating that liquidity constrained borrowers responded meaningfully to the easing of down payment requirements.

I also examine whether this effect is particularly pronounced among first-time homebuyers, who typically lack home equity and are more likely to be constrained by cash-on-hand (Berger et al., 2020). The results confirm that first-time buyers are strongly responsive to the policy change. First-time buyer high-LTV originations per rental households increased by over 21% in treated tracts. This large response underscores the importance of downpayment constraint in the transition from renting to homeownership. I also explore the mechanisms driving increased originations. I

find no significant increase in loan applications, suggesting that the rise in lending was not primarily due to greater participation. Rather, denial rates, particularly those linked to liquidity constraints declined substantially, indicating that improved approval outcomes were the dominant channel.

Next, I assess whether this expansion in mortgage credit translated into increased housing demand and upward pressure on local house prices. Using tract-level house price indices from FHFA, I find that treated tracts experienced significantly faster house price growth between 2016 and 2018. Estimates suggest a 1.05 percentage point increase in cumulative house price growth, equivalent to a 12.7% gain relative to control tracts within the same MSA. This finding provides compelling evidence that easing liquidity constraints can appreciate house prices.

While there is an overall increase in high-LTV mortgage originations, the magnitude of this effect varies across housing markets. A central objective of low-down payment programs is to expand credit access in high-cost areas, where homebuyers often face the most burdensome liquidity constraints. To assess this heterogeneity, I examine how the program's effects vary with housing affordability, proxied by the price-to-rent ratio at the metropolitan statistical area (MSA) level. The price-to-rent ratio captures the relative cost of owning versus renting and is widely used to measure housing market tightness

A simple user-cost framework (Poterba, 1984) suggests theoretically ambiguous effects of down payment relaxation across price-to-rent. On one hand, high price-to-rent areas may exhibit greater increases in eligibility due to steeper down payment burdens. On the other hand, such areas are also more likely to be characterized by elevated user costs and income constraints, which may dampen house ownership demand even as downpayment constraint eases. To explore this empirically, I estimate an RDD model with interaction terms between treatment and the price-to-rent ratio as well as its square. Results indicate a bell-shaped pattern, where the effect of down payment relaxation is strongest in mid-range price-to-rent markets and weakens in both low and high-cost housing markets. This pattern is consistent with the theoretical

trade-off between liquidity constraints and affordability-driven preference for renting.

The effect of down payment constraint relaxation on house prices operates through a unique channel, distinct from those of credit scores (Mian and Sufi, 2009), interest rates (Adelino et al., 2025), or broader credit expansions like branch deregulation (Landier et al., 2017). Importantly, this mechanism primarily targets first-time buyers (FTBs), who lack housing equity and thus face the greatest liquidity constraints. Because FTBs exit the rental market upon purchasing a home, housing demand increases in owned segment and reduces in rental segment. Consequently, the net price effect depends on the degree of integration between owner and rental housing segments.

I conceptualize this by developing a framework where housing markets contain three types of units: owner-only, rental-only, and convertible units that can both be rented or owned. Housing markets with a high share of convertible units, measured using the prevalence of attached 1–4 unit structures are more integrated, allowing for smoother transitions between rental and ownership. In such markets, the increase in FTB demand is offset by declining investor demand driven by reduced rental demand, leading to smaller price effects. In contrast, weakly integrated markets with very low share of convertible units experience stronger price responses due to frictions and limited supply substitution.Using tract-level data from the American Community Survey, I construct multiple measures of market integration and interact them with the treatment in an RDD framework. The results show consistently negative and significant interaction terms, indicating that house price effects decline with rising housing market integration. Quartile-based analysis further confirms that price effects are most pronounced in the least integrated markets.

This paper contributes to a growing literature on credit conditions and their influence on mortgage origination and housing markets. Foundational work by (Mian and Sufi, 2009, 2011; Purnanandam, 2011; Keys et al., 2010) emphasized how shifts in credit supply, especially through securitization shaped access to mortgages and household leverage prior to the financial crisis. More recent studies (Beraja

et al., 2019; Corbae and Quintin, 2015; Dagher and Fu, 2017) have explored credit constraints and the effects of regulatory changes on mortgage originations. This paper complements these studies by isolating the role of the down payment requirement, a specific liquidity constraint, and evaluating its effects through the means of high LTV mortgage originations.

It also adds to the literature examining the impact of credit supply on house prices. Several studies (Favara and Imbs, 2015; Di Maggio and Kermani, 2017; Ferreira and Gyourko, 2023; Greenwald, 2018; Mian and Sufi, 2022; Landier et al., 2017; Blickle, 2022; Adelino et al., 2025; Carozzi et al., 2024) have documented strong house price responses to credit expansions. I build on this work by demonstrating how local housing market integration often plays a role in the magnitude of house price responses. Finally, the paper contributes to the literature on GSE interventions (Foote et al., 2012; Adelino et al., 2013; Bhutta, 2015). Unlike broad policy changes, I examine targeted, scalable GSE programs, HomeReady and Home Possible that indirectly alter down payment requirements, offering new insight into their effects on mortgage and housing market.

2 Institutional Setting and Data

2.1 Low Downpayment Mortgage Program

I describe below the low down-payment programs that serve as a quasi-experimental setting to study the effect of relaxing down-payment constraints. In December 2015, Fannie Mae launched HomeReady (HR) and Freddie Mac launched Home Possible (HP), with the shared objective of enabling low- and moderate-income borrowers to achieve homeownership. These programs were developed and introduced in coordination and feature identical benefits and eligibility criteria. Designed to assist borrowers with limited savings, the programs offer pricing incentives. For instance, it waived risk-based loan-level price adjustments (LLPAs) [1] for mortgages with loan-to-value

[1] LLPAs are risk-based fees charged by Fannie Mae and Freddic Mac to compensate them for the default risk associated with borrower. LLPAs are applied based on specific risk factors and LLPAs increase with credit score and LTV ratio.

(LTV) ratios above 80% and borrower credit scores exceeding 680 and capped LLPAs at 150 basis points for rest of the mortgages. It also reduced mortgage insurance coverage requirements for high-LTV loans: standard coverage was lowered from 35% to 25% for loans above 95% LTV and from 30% to 25% for loans above 90% LTV [2]. These benefits had the effect of reducing the downpayment requirement, especially for high leverage borrowers. This requires further explanation which I provide in the next paragraph.

LLPAs are the guarantee fees charged by Fannie Mae and Freddie Mac to the lender in exchange for insuring the mortgage against default. Lenders are required to pay these fees upfront prior to selling the mortgage to Fannie Mae. In practice, lenders typically pass these costs on to borrowers by capitalizing them into the interest rate. However, borrowers with very high leverage (LTV > 95%) face bulk of their LLPA fee is charged as an upfront cost. This arises because lenders are reluctant to finance these fees into the loan by increasing interest rate as doing as would cause the effective LTV to exceed the permissible maximum LTV of 97%. The requirement to pay LLPAs upfront can substantially increase the cash needed at closing, for high leverage borrowers. Therefore, the waiver and capping of LLPA fees under HR and HP program would reduce the downpayment burden of high leverage (LTV > 95%) borrowers. As a result, there would be a significant difference in the downpayment requirement between high leverage borrowers participating in the HR and HP programs compared to those outside these programs. It follows that participation in HomeReady and Home Possible programs effectively relaxes the down payment constraint for highly leveraged borrowers

2.2 Borrower Eligibility for HomeReady and Home Possible Program

Although Fannie Mae and Freddie Mac launched HomeReady (HR) and Home Possible (HP)respectively in December 2015, similar programs directed at low- and

[2]All conventional loans with LTV ratio greater than 80% have mandatory requirement of mortgage insurance.

moderate-income homebuyers existed previously in different names[3]. While these older programs had similar features and benefits, what was different about HomeReady and Home Possible was its unique eligibility criteria where borrowers in certain geographical areas were exempt from income-based limits to be eligible for the programs. The eligibility for HR and HP programs was based on borrower income, where Borrower income must be below 100 percent of the area median income (AMI). However, geography-based exceptions applied: there were no income limits for borrowers in low-income census tracts. In other words, every borrower with properties in low-income census tracts were eligible for this program while only borrowers with income below 100% AMI were eligible in other census tracts. Although many borrowers are eligible based on income criteria, Fannie Mae and Freddie Mac apply various underwriting rules to approve and select borrowers for these programs. Usually, the selection of borrowers for these programs were based on a combination of credit score, DTI and LTV. In June 2019, Fannie Mae and Freddie Mac revised their programs to remove income limit exemptions applicable to low-income census tracts. Accordingly, our empirical tests are restricted to the period till 2019.

2.3 Evolution of HomeReady Porgram

HomeReady was announced in December 2015 and launched on a pilot basis in a limited number of locations during the first quarter of 2016. The program was then expanded nationwide by 2017. Figure 1 tracks the number of mortgages originated under the HomeReady program from 2016 onwards. As shown, the number of HomeReady mortgages increased from a very small base in 2016Q1 to over 20,000 by 2017Q2. The share of HomeReady loans relative to total Fannie Mae mortgage originations also rose steadily, peaking at approximately 18% in 2019Q1. Following the removal of income limit exemptions for low-income census tracts in 2019Q2, this share declined, falling below 10% by 2020Q1. Given this timeline, our empirical analysis

[3]Fannie Mae's program MyCoummunityMortgage was replaced by Homeready and Freddie Mac's Home Possible Advantage was replaced by Home Possible

focuses on the years 2017 and 2018, with particular emphasis on 2018, for which loan-to-value (LTV) data are available.

2.4 Low Income Census Tracts

Legally, the states within US are subdivided into counties, which are subdivided into census tracts. However, for many statistical applications, various institutions employ Metropolitan Statistical Areas (MSAs) as a geographical unit of analysis. MSAs are regions with an urban area at its core and could span across multiple cities or towns, often across different states. Each MSA would on average consist of xxx census tracts. A low-income census tract is defined as a census tract in which the median income of the tract does not exceed 80 percent of the MSA median income (AMI). US Census Bureau publishes the median income of MSA based on American Community Survey conducted every year. Prior studies (Agarwal et al., 2012; Bhutta, 2011; Saadi, 2020) have employed either a difference-in-differences approach or a regression discontinuity design (RDD) using low-income census tracts as a treatment group. While their identification is based on low-income tracts being eligible for ratings under Community Reinvestment Act and FHFA housing goals, to the best of my knowledge, I am the first to apply this identification strategy to capture an exogenous reduction in the downpayment requirement based on the eligibility criteria of the HR and HP programs.

2.5 Data

Mortgage-level data comes four sources – FHFA enterprise database, Fannie Mae Data Dynamics, Freddie Mac Clarity Data Intelligence loan-level dataset and HMDA dataset. The primary dataset for the study was the FHFA enterprise database Single-Family Census tract file; It provides loan-level data of single-family mortgage acquisitions of Fannie Mae and Freddie Mac with tract level details. It includes data regarding income, race, gender, age, first-time buyer status, unpaid principal balance, loan purpose, occupancy status and more. Starting from 2018, FHFA included debt-to-

income (DTI) ratio, Loan-to-value (LTV) ratio, and property value along with several other data elements. The empirical analysis on high LTV mortgage acquisition relies on dataset that became available on 2018, as the FHFA dataset before 2018 didn't include data on LTV. There is a separate FHFA dataset – single-family mortgage level dataset (File A) that provides LTV categories, but without the census tract details. I use that dataset to track the high LTV acquisition before 2018.

I rely on Fannie Mae Data Dynamics, Freddie Mac Clarity Data Intelligence to obtain data on credit score, delinquencies, HomeReady and Home Possible status for each mortgage. Similarly, I gather data on origination fees, loan denials and denial reasons from HMDA dataset. HMDA also provides loan-level data reported by all agencies including those other than Fannie Mae and Freddie Mac, thereby providing comprehensive data across all loan purchasers. The FHFA data is merged with Fannie Mae's Data Dynamics and Freddie Mac's Clarity Data Intelligence to construct a consolidated dataset, the details of which are provided in Appendix.

I obtain house price data from multiple sources. My primary source is FHFA house price index (HPI) for single-family homes. FHFA HPI is a weighted repeat-sales index and measures average price changes in repeat sales or refinancings on the same properties. FHFA HPI is available at various geographical levels, including at the level of census tract. Second, I obtain proxies for house price changes from FHFA uniform appraisal dataset (UAD) aggregate statistics. I construct different measures of house price changes based on changes in median, mean, 25th percentile and 75th percentile of appraisal values in the census tract.

I use employment, income, education, and housing related data at census tract level from American Community Survey (ACS). ACS provides tract level data based on estimate arrived by the Census Bureau based on monthly survey conducted in previous 5 years. As the census tracts are smaller in size and as sample sizes are expected to be small, census bureau provides only 5-year estimates. Each month, the survey targets 1/400th of the population, effectively implying that the 5-year estimates are based on 13% of the population, which is a reasonable sample. These

estimates from ACS are primarily used in cross-sectional results, where variation of these variables across time is not a factor.

2.6 Sample Construction

The sample was refined to exclude some observations. While the HR and HP programs apply to rural areas, my focus is solely on urban areas. This is because I am interested in their impact on house prices in regions with low housing supply elasticity, and HMDA data from rural census tracts tends to be unreliable. Hence, I exclude rural census tracts from my sample. Urban tracts constitute around 84% of all tracts within US. In the loan-level HMDA sample, I restrict my sample to loans with purchase type and owner-occupied properties as only single-unit, owner-occupied primary residences are allowed under HR and HP programs. I exclude loans with manufactured housing, as manufactured housing mortgages are allowed only with an LTV up to 95 percent under HR and HP programs.

3 Empirical Strategy

The eligibility criteria for the HR and HP programs introduce two thresholds: one at the census tract level and another at the borrower level. At the tract level, there is a discontinuity in the share of eligible borrowers at the 80% Area Median Income (AMI) cutoff. In census tracts with median incomes below 80% of AMI, all borrowers are eligible for the programs. In contrast, in tracts above this threshold, only borrowers with incomes below 100% of AMI are eligible. At the borrower level, a threshold of 100% AMI determines eligibility for borrowers residing in tracts other than low-income census tracts. These institutional rules enable two quasi-experimental regression discontinuity designs (RDDs): one exploiting the 80% AMI threshold at the tract level, and another using the 100% AMI threshold at the borrower level in non-low-income tracts. Most of the empirical analysis focuses on the tract level, as the impact on house prices can only be observed at this level of aggregation.

3.1 Regression Discontinuity Design

I obtain the casual identification by exploiting eligibility criteria for the HomeReady and Home possible programs. As detailed earlier, these programs created a sharp discontinuity in the share of eligible borrowers at census tracts with median income of 80% of AMI. Tracts below the 80% AMI threshold have 100% borrower eligibility, whereas tracts above the threshold have only eligibility restricted to borrowers with incomes below 100% AMI. Accordingly, there is a discontinuity at the 80 percent AMI threshold in the share of borrowers eligible for reduced payment requirements.

The prevailing convention on regression discontinuity design requires me to adopt sharp regression discontinuity to estimate the local average treatment effect of relaxation of downpayment constraint. The running variable for the RDD would be the ratio of median income of census tract to area median income, which I would refer now as tract-to-area income ratio or TAI ratio. The threshold for the running variable would be 0.8. Tracts with TAI ratio below or equal to 0.8 are defined as treated, while those above 0.8 are defined as control. My empirical specification would be local linear regression within a given bandwidth of the threshold. As the outcome variable defined at the census tract level is very likely to vary with tract-to-area income ratio, it is necessary to use our running variable, tract-to-area income (TAI) ratio as a control in either side of the threshold.

$$Y_{cm} = \alpha + \beta_0 \mathbb{1}[I_{cm} < 0.8] + \beta_1 I_{cm} + \beta_2 \mathbb{1}[I_{cm} < 0.8] I_{cm} + \mu_m + X_{cm}\gamma + \epsilon_{cm} \qquad (1)$$

I use the above specification for RDD at tract level, where Y_{cm} is the outcome variable in census tract c and Metropolitan Statistical Area (MSA) m, I_{cm} is the tract-to-area income ratio, and X_{cm} is a vector of tract level controls. Tract level controls include demographic and economic variables such as log of population, employment rate, share of rented, the share of vacant houses, and share of college-educated population. I include μ_m, MSA fixed effects to compare tracts within the same MSAs to control for

local economic factors. I cluster the standard errors at the MSA level.

To proceed with this research design, I first need to verify that discontinuity in the share of eligible borrowers at the cutoff of 80% AMI reflects in the discontinuity in the share of borrowers participating in the HomeReady program. I I apply the above RDD specification, where the outcome variable is the number of HomeReady Mortgages as a share of mortgages originated by Fannie Mae. Figure 2 provides evidence of sharp discontinuity in the share of HomeReady mortgages and shows that share of HomeReady mortgages increases by 5.5 percentage points at the threshold.

3.2 Identifying Assumptions

The identification assumption of the RDD is the continuity of all other tract characteristics other than share of borrowers eligible for downpayment relaxation at the treatment threshold. If there are tract characteristics that are discontinuous at this threshold that are potentially likely to affect the outcome variables such as high LTV mortgage acquisition or house price, then the identification assumption is violated. For instance, unemployed individuals are less likely to be qualified for mortgages and if there was a discontinuity in the unemployment rate across the threshold, it can create discontinuity in the rate of high LTV mortgage acquisition. I test for the continuity of tract characteristics such as unemployment rate, share of college educated, share of minority population, share of young population, share of single-family housing units, share of vacant units using the RDD empirical specification. I obtain data for these variables from ACS survey 2018, which provides the 5-year estimates from 2011-2016. The results depicted in Table A.I report the coefficients of beta, which are statistically insignificant. As expected, the RDD plots in Figure A.I show that these characteristics are smooth and continuous across the threshold.

While I claim that relaxation of downpayment requirement led to various outcomes, there could be changes in other mortgage related characteristics that could have led to such an outcome such as relaxation of DTI norms, relaxation of credit score requirement, lower interest rate that could affect the mortgage acquisition rate and

thereby the house prices. Therefore, these mortgage characteristics must also be continuous at the threshold for the RDD specification to be valid.

While I argue that the relaxation of the down payment requirement led to various outcomes, it is important to consider that other mortgage-related characteristics may have also changed and contributed to these outcomes. For instance, there could have been a loosening of debt-to-income (DTI) requirements, reductions in credit score thresholds, or lower interest rates, which could have affected mortgage acquisition rate and, consequently, house prices. Therefore, for the RDD specification to be valid, these mortgage characteristics must also remain continuous at the policy threshold.

I test this assumption by examining the smoothness of key mortgage characteristics. I estimate the share of high-DTI borrowers, the share of near-prime borrowers (defined as those with credit scores below 660), and the average interest rate at the census tract level for mortgages acquired by Fannie Mae and Freddie Mac. None of these variables exhibit significant discontinuities at the threshold, and the RDD coefficients are statistically insignificant. This supports the validity of the RDD design by suggesting that any observed discontinuities in house prices or high-LTV mortgage acquisitions are unlikely to be driven by changes in other mortgage characteristics.

Second condition for validity of the identification assumption is the absence of manipulation around the cutoff. If tracts manipulate their median income to fall below the threshold, there would be significant difference in the number of tracts between just above and just below the cutoff. The histogram plot with density of tracts does not appear to show any jump or discontinuity in the density across the threshold. I use the (McCrary, 2008) density test to formally prove the absence of manipulation. As shown in Figure A.II, the test confirms the absence of any significant discontinuity in tract density at the threshold, suggesting that manipulation is unlikely.

Third condition that could threaten identification assumption is presence of other policies that use the same cutoff. There are two policies using the same cutoff that are cause of concern – the FHFA housing goals and Community Reinvestment Act. The FHFA sets loan purchase targets for Fannie Mae and Freddie Mac every three years,

specifying the proportion of loans that must come from three groups: low-income borrowers, very low-income borrowers, and residents of low-income areas. Notably, the definition of low-income areas under the FHFA goals aligns with the threshold used in the HomeReady (HR) and Home Possible (HP) programs. I address this concern by choosing strategy that disentangles the effects of the HomeReady (HR) and Home Possible (HP) programs from those of the FHFA goals. The details of this approach are discussed below.

The FHFA sets a subgoal requiring that 18% of its loan purchases originate in low-income areas. These areas include low-income census tracts and minority census tracts. Minority census tracts are tracts that have at least 30% minority population and have tract median income below 100% of AMI. In other words, FHFA goals apply to all census tracts with incomes below 80% of AMI, as well as tracts with at least 30% minority population and incomes between 80% and 100% of AMI. This structure allows me to focus on a subsample of minority census tracts for empirical analysis: within this subsample, FHFA housing goals apply on both sides of the low-income census tract threshold, whereas the HR and HP exemptions are confined to tracts below the threshold. Hence, the final sample was constructed to include only minority census tracts to isolate the effect of HR and HP program from FHFA housing goals. Minority census tracts constitute around 54% of all census tracts with income below 100 percent AMI

Next, I address concerns about the Community Reinvestment Act (CRA) using the same threshold as the HR and HP programs in its implementation. The CRA is designed to encourage banks to meet the credit needs of low- and moderate-income (LMI) neighborhoods, which are defined as census tracts with median incomes below 80% of the area median income (AMI).

While the CRA does not mandate specific lending targets or volumes for LMI neighborhoods, it requires regulators to periodically assess a bank's lending performance in these areas. Banks receive a rating on a four-tier scale, ranging from Outstanding to Substantial Noncompliance. Although CRA ratings are not legally enforceable, they

are taken into account when banks seek approval for branch openings, mergers, or acquisitions. However, due to significant examiner discretion and limited enforcement, it remains unclear whether the CRA has meaningfully increased mortgage lending in LMI neighborhoods. The existing literature provides mixed evidence—some studies find no effect, while others report only marginal and temporary increases in originations. Despite the limited impact of the CRA, it is important to verify that it does not introduce a discontinuity in mortgage originations at the 80% AMI threshold. To test this, I employ a regression discontinuity (RDD) design using data from 2013 to 2015—a period when the CRA was active, but the HR and HP programs were not yet implemented. The outcome variables are mortgage originations normalized by population, number of households, and adult population in each tract, to account for tract size variation. I find no evidence of a discontinuity in mortgage originations at the cutoff.

An additional consideration is that the CRA does not apply to independent mortgage companies or non-bank lenders, often referred to as "shadow banks." Since the share of loans originated by such entities increased significantly after the 2008 financial crisis, the effectiveness of the CRA likely declined during the 2017–2019 period. To disentangle the effects of the CRA from those of the HR and HP programs, I conduct robustness checks on a subsample of tracts where independent mortgage companies dominate loan originations. The main findings on high-LTV mortgage acquisitions and house prices remain robust in this subsample.

4 Results and Discussion

4.1 Effect of relaxing downpayment constraint on High LTV originations

I begin by examining the effect of relaxing down payment constraints on high-LTV mortgage originations. Mortgages with reduced down payment requirements

offered by Government-Sponsored Enterprises (GSEs) typically fall within the loan-to-value (LTV) range of 95 to 97 percent. When the down payment constraint is relaxed, borrowers who were previously liquidity-constrained may become eligible for mortgages within this LTV range. As expected, the results presented in Table 1 indicate that exogenous reduction in down payment requirements under the HR and HP programs led to a substantial increase in high-LTV mortgage originations. I define high-LTV loans as those with an LTV ratio exceeding 95 percent.

To assess the impact on high-LTV mortgage originations, I employ RDD specification as outlined in Equation 1. Given that LTV data is available only from 2018 onwards, I utilize FHFA loan dataset for 2018. As described in Section 2.3 , the HR and HP programs achieved their peak in 2018, making this year the most suitable for measuring their effects. Since census tract sizes vary significantly, it is necessary to normalize the dependent variable to ensure comparability across tracts. Accordingly, I normalize high-LTV mortgage originations by: dividing high-LTV loans by all originations (Column 1), total population (Column 2), number of households (Column 3), and adult population (Column 4). Panel A of Table 1 reports the RDD estimates for a sample of tracts within the optimal bandwidth, which is calculated following (Calonico et al., 2014) and estimated to be 0.129. This implies that the sample in Panel A includes all tracts with a tract income-to-AMI ratio within ±0.129 of the cutoff. For robustness, I also present results for narrower bandwidths of 0.1 in Panel B and wider bandwidths of 0.2 in Panel C.

The results in Panel A of Table 1 show that the coefficient in Column 1 is positive and statistically significant, indicating a discontinuity in the share of high-LTV loans at the cutoff. Specifically, the share of high-LTV mortgage originations increases by 1.52 percentage points for treated tracts, representing an 8.2% higher share relative to control tracts. Similarly, Columns 2 through 4 reveal that treated tracts exhibit 10.5% higher high-LTV originations per capita, 10.8% higher originations per household, and 9.58% higher originations per adult population compared to control tracts.

Figure 3 provides graphical evidence of how the share of high-LTV originations

changes across the threshold, displaying a clear discontinuity at the cutoff. On either side of the threshold, the share of high-LTV loans declines as the tract income-to-AMI ratio increases. This is a pattern consistent with the expectation that borrowers in lower-income tracts are more likely to face liquidity constraints and, thus, prefer high-LTV loans.

4.2 Effect on First time Buyer High LTV originations

First-time buyers are more likely to face down payment constraints than existing homeowners, as the latter can refinance their current property to access the liquidity needed for a new mortgage. HMDA data indicate that insufficient cash or collateral accounts for 26% of loan denials among first-time buyers, compared to only 5% for existing homeowners. Thus, relaxing down payment requirements is likely to have a stronger impact on first-time buyers.

I investigate the effect of easing down payment constraints on high loan-to-value (LTV) originations among first-time buyers. Using the same RDD specification, data, and sample as in the previous section, I focus on first-time buyer high LTV (FTB HLTV) mortgage originations as the variable of interest. As in earlier regressions, I adjust FTB HLTV originations for tract size variations. Since first-time buyers predominantly come from rental households, Column 2 in Table 2 captures the share of originations relative to rental households for a better perspective. To normalize, I divide FTB HLTV originations by: all originations (Column 1), number of rental households (Column 2), total households (Column 3), and population (Column 4).

The most salient finding concerns FTB HLTV originations per rental household. Panel A of Table 2 shows a positive and statistically significant coefficient in Column 2, indicating a discontinuity in FTB HLTV originations per rental households at the cutoff. Specifically, FTB HLTV originations per rental household increase by 21.3% in treated tracts relative to control tracts. Figure 4 (b) graphically illustrates this pattern, showing a clear discontinuity at the threshold. Importantly, the 21.3% increase observed for FTB HLTV originations is larger than that for all HLTV originations, suggesting a

stronger effect of down payment relaxation on first-time buyers.

4.3 Effect on relaxing downpayment constraint on House Prices

The reduction in down payment requirements led to an exogenous increase in high LTV mortgage originations. This section examines whether this increase, driven by down payment relaxation, affects house prices. House price growth depends on various demand-related factors such as income, demographics, housing supply mix, and amenities (Glaeser et al., 2006; Gyourko et al., 2013; Favara and Song, 2014). As established earlier, these factors exhibit no discontinuities at the threshold, making them unlikely confounders in our RDD framework. (Favara and Imbs, 2015) demonstrate that exogenous credit supply shocks can influence house prices. While their study focuses on heterogeneity in branching regulations, this paper isolates shocks to mortgage originations arising purely from a relaxation of down payment constraints.

The outcome of interest is house price growth from the end of 2016 to the end of 2018. The empirical analysis focuses on 2017 and 2018, as the HR and HP programs were fully implemented by late 2016, and exemptions for low-income census tracts ended in mid 2019. Tract-level house prices are sourced from FHFA's HPI, and cumulative growth over 2016–2018 is computed.

Table 3 reports RDD estimates of house price growth using the optimal bandwidth, as well as bandwidths of 0.1, 0.15, and 0.2. Panel A shows that coefficients across all specifications are positive and statistically significant, indicating a robust discontinuity in house price growth at the cutoff. Column 1 suggests that house prices in treated tracts increased by 1.05 percentage points, equivalent to a 12.7% rise relative to control tracts. Figure 5 corroborates this finding, visually illustrating a clear jump in house price growth at the threshold. Together, these results provide evidence of a causal link between down payment relaxation and house price appreciation, motivated by exogenous reduction in downpayment requirements in treated tracts.

4.4 Effect on Loan Applications and Loan Rejections

When the down payment constraint is relaxed, it is important to investigate how high LTV mortgage originations increase. Two potential mechanisms may account for this increase. First, the relaxation may encourage a greater number of applications, as awareness of the HR and HP programs encourages previously constrained borrowers to enter the mortgage market. Second, the design features of these programs may broaden borrower eligibility, thereby reducing the incidence of loan denials.

To assess which mechanism is primarily responsible for the observed increase in high-LTV originations, I estimate loan applications and denial rates at the tract level. HMDA loan-level dataset reports the approval status of each application and provides detailed reasons for loan denials. The five most cited reasons include: low credit score, high debt-to-income ratio, insufficient cash, insufficient collateral, and inadequate employment history. Of these, insufficient cash and insufficient collateral most directly reflect liquidity constraints faced by borrowers. Loan rejections due to insufficient collateral typically indicate that the appraised property value was lower than expected, preventing the borrower from satisfying the LTV requirement given their available funds. Accordingly, I classify both insufficient cash and insufficient collateral as denials attributable to liquidity constraints.

Table 4 presents RDD estimates for loan application and loan denial rates. The RDD coefficient for loan applications per capita is positive but statistically insignificant, suggesting that the reduction in down payment requirements only led to a marginal increase in mortgage applications. This finding indicates that the HR and HP programs were not effective in stimulating additional loan applications. However, loan denial rates declined by 3.1 percentage points in treated tracts, representing a 12% reduction relative to the control group. This suggests that the primary mechanism through which HR and HP programs operated was by improving loan approval rates rather than increasing application volume. Notably, loan ejections due to liquidity constraints declined even further. Column 4 shows that the share of loans denied due to liquidity constraints (insufficient cash or collateral) fell by 0.5 percentage points, corresponding

to an 11% reduction compared to the control group.

4.5 Housing Market Heterogeneity Based on Price-to-Rent Ratio

The relaxation of down payment constraints has led to an increase in high LTV mortgage originations. However, it remains unclear which geographic areas or housing markets experience the strongest effects. A key objective of low downpayment programs is to expand mortgage access in high-cost housing markets, where prospective buyers often struggle to accumulate sufficient funds for a down payment. Therefore, identifying the housing markets that exhibit the largest responses is central to evaluating the policy's effectiveness. To capture housing market conditions, I use a measure of housing affordability defined by the price-to-rent ratio, the ratio of median house prices to median rents within a given metropolitan statistical area (MSA). In the following paragraph, I outline a theoretical framework that illustrates why direction of effect of downpayment with price-to-rent is theoretically ambiguous.

The framework builds on the user cost model introduced by (Poterba, 1984), with modifications based on (Glaeser et al., 2012). Households choose between renting and owning based on the relative cost of each option. Renting involves a recurring payment of R_t, while homeownership entails a mortgage with periodic payments determined by the mortgage interest rate r_t, and a required down payment θ, proportional to the house price P_t. Homeowners also incur maintenance costs and property taxes equal to τP_t, but benefit from a mortgage interest tax deduction at a rate ϕ. Assuming that rents and maintenance costs grow at rate g and that the discount rate is equal to the mortgage rate, the household's indifference condition between renting and owning can be expressed as follows:

$$\frac{R_t}{P_t} = (1 - \phi) r_t - g + \tau$$

As the price-to-rent ratio increases, a greater proportion of households are expected to prefer renting over homeownership. Let S denote household savings, distributed

according to dS. To qualify for a mortgage, a household must have sufficient savings to cover the required down payment: The marginal increase in required savings for a one-unit increase in the down payment rate θ is:

$$S \geq \theta P_t$$

$$\frac{dS}{d\theta} \geq P_t$$

Thus, the savings required to meet the down payment increases proportionally with house prices. Assuming a uniform distribution of savings, a reduction in the down payment requirement would make a larger number of households eligible in higher price-to-rent markets.

In addition to the liquidity constraint, borrowers must also satisfy an income constraint tied to the debt-to-income (DTI) ratio. The minimum required income to meet this constraint is:

$$\text{Income} = \frac{\text{DTI}}{P_t \cdot r}$$

Bringing these conditions together yields three key implications. First, the user cost model implies that the share of households preferring ownership over renting decreases with the price-to-rent ratio. Second, the number of households becoming newly eligible due to a lower down payment requirement increases with the price-to-rent ratio. Third, the number of households satisfying the DTI constraint decreases as the price-to-rent ratio rises.

Thus, two mechanisms suggest reduced eligibility in high price-to-rent markets (via user cost and income constraint), while one mechanism (liquidity constraint) works in the opposite direction. As a result, the net effect of down payment relaxation on high LTV mortgage originations across the price-to-rent ratio is theoretically ambiguous. The first step towards resolving this ambiguity is to understand the nature of variation of the effect with price-to-rent, whether it is linear or non-linear. In order to test the

same, I estimate RDD estimates using the following specifications, where I interact the indicator variable with price-to-rent and square of price-to-rent. Price-to-rent is measured at the MSA level, as the real estate agencies and developers define housing markets at MSA level and variation of price-to-rent within a MSA is much smaller than variation across MSAs. Price-to-rent ratio is sourced from the 5-year average estimates median house price and median rent from 2011-2016 from the American Community Survey 2011-2016.

The results of the regression are reported in Table 5. The coefficient of interaction term involving price-to-rent is positive and square of price-to-rent is negative, while both being significant. This suggests that variation of the effect on high LTV originations follow an inverse U curve, where the effect increases initially and reach peak, after which it starts declining. I validate these results by decomposing the effects across quartile distribution of price-to-rent. The sample within optimal bandwidth is divided into four subsample each representing a quartile of price-to-rent. The RDD estimates that measure the impact on overall and FTB high LTV originations are plotted across the quartiles in figures 6 and 7. As expected, it shows that impact is relatively lower at the first quartile and reaches the maximum at second quartile and then declining in third and fourth quartiles.

The results are consistent with the theoretical framework: In low price-to-rent housing markets, although households prefer owning over renting, the relaxation of downpayment constraint makes little difference as most households are not constrained by it due to low house prices. Medium price-to-rent housing market observes the strongest effect, as the household still prefer owning over buying, but the house prices are high enough to ensure that a marginal relaxation of downpayment constraint makes large number of households eligible for mortgages. In high price-to-rent ratio housing market, even larger number of households are eligible for mortgage from relaxation of downpayment constraint, but the house prices are so expensive that they prefer renting over owning, thereby leading to a smaller effect. Thus, two mechanisms suggest reduced eligibility in high price-to-rent markets (via user cost and

income constraint), while one mechanism (liquidity constraint) works in the opposite direction. As a result, the net effect of down payment relaxation on high LTV mortgage originations across the price-to-rent ratio is theoretically ambiguous.

I address this ambiguity by first examining the functional form of the relationship between price-to-rent and the policy's impact, specifically whether the effect varies linearly or non-linearly. I investigate this relationship by estimating an RDD specification in which the treatment indicator is interacted with the price-to-rent ratio and its squared term. Price-to-rent is measured at the metropolitan statistical area (MSA) level, reflecting the common definition of housing markets by real estate professionals and developers. Also, within-MSA variation is relatively small compared to the variation across MSAs. The price-to-rent ratio is constructed using five-year average estimates (2011–2016) of median home values and median rents from the American Community Survey.

Regression results are reported in Table 5. The coefficient on the interaction with price-to-rent is positive and statistically significant, while the coefficient on its squared term is negative and significant. This indicates an inverse U-shaped relationship: the effect of down payment relaxation on high LTV originations initially increases with price-to-rent, reaches a peak, and then declines.

To validate this result, I divide the sample within the optimal bandwidth into quartiles based on the distribution of the price-to-rent ratio and estimate the RDD specification separately for each quartile. Figures 6 and 7 plot the resulting coefficients for overall and first-time buyer (FTB) high LTV originations, respectively. As expected, the impact is lowest in the first quartile, peaks in the second, and declines through the third and fourth quartiles.

These patterns align with the theoretical framework. In low price-to-rent markets, although households tend to prefer owning over renting, the down payment constraint is not binding for most, as house prices are relatively affordable. In mid-range price-to-rent markets, house prices are high enough to make the down payment constraint binding for many. Accordingly, relaxation of downpayment constraint with households

still preferring ownership, yields the strongest response. In high price-to-rent markets, although more households become technically eligible, the prohibitively high housing costs shift preferences toward renting, attenuating the effect of the policy.

4.6 Impact on House Price: Heterogeneity by Housing Market Integration

The relaxation of the down payment constraint influences house prices through a distinct mechanism, unlike other mortgage-related factors such as credit scores, interest rates, or income constraints, and unlike broad credit supply expansions such as mortgage securitization or branching deregulation. Notably, down payment constraints primarily affect first-time buyers (FTBs), as existing homeowners often have assets that can be liquidated or refinanced to fund down payments. The disproportionately strong effect on FTBs is empirically supported in tract-level results (Table 2) and borrower-level analysis.

Second, the prominence of FTBs links mortgage activity to rental markets, since homeownership by FTBs implies their exit from the rental market. Consequently, both the ownership and rental segments of the housing market are affected. Third, the ultimate impact on house prices depends on the degree of integration between the owner-occupied and rental housing segments. The greater the integration, the smaller the net impact on house prices.

To capture this concept, I propose a simplified framework in which each housing market comprises three types of housing units: (1) owner-only, (2) rental-only, and (3) convertible units which are units that can be either rented or owned. The share of convertible units serves as a proxy for the degree of market integration. In the two polar cases: A fully integrated housing market consists entirely of convertible units, enabling seamless transitions between renting and owning. In such markets, increased demand from FTBs is counterbalanced by reduced rental demand, resulting in little to no net effect on house prices. A fully segmented market consists only of rental-only

and owner-only units, limiting the ability of households to switch between tenure types. In these markets, the entry of FTBs leads to stronger upward pressure on house prices due to frictions and limited supply responsiveness. While real-world markets lie between these extremes, this framework provides a basis for estimating housing market integration and understanding its moderating effect on house price responses to downpayment policy changes.

I quantify the degree of integration within a housing market by utilizing the composition of housing structures. Existing data from housing surveys suggests that owner-occupiers and investor buyers tend to favour distinct types of housing. Owner-occupiers typically prefer detached single-family homes, while investors are more likely to purchase multi-family units such as apartments, due to lower maintenance costs and reduced exposure to tenant-related risks. This preference pattern is evident in data from the American Community Survey: 88% of owner-occupied units are detached single-family homes, whereas 45.2% of renter-occupied units are in multi-unit apartment buildings.

I rely on data from the 2009 American Housing Survey, which tracked the tenure status of housing units over a 30-year period. This dataset distinguishes among units that have always been owner-occupied, always rented, or transitioned between the two. Table A.II provides a glimpse of which type of housing structure is likely to be both rented and owned. One housing structure type has a unique position: attached, 1–4 unit structures. According to the survey, 34.5% of these units have experienced both rental and ownership tenure, while 23.7% have always been owned and 41.9% always rented. This distribution suggests that attached, 1–4 unit structures are most likely to support both tenures, making them suitable indicators of market integration. In contrast, other housing types tend to be tenure-specific: detached single-family homes are predominantly owner-occupied, while multi-family apartment structures are almost exclusively rented. Based on these observations, I construct a measure of housing market integration using the share of attached, 1–4 unit structures in each market. A higher share implies greater potential for conversion between rental and

ownership segments, and thus, a higher level of integration.

I obtain tract-level counts of housing structure types from the American Community Survey to construct measures of housing market integration. Specifically, I define four alternative measures of integration that estimate the share of housing units likely to support both rental and ownership tenures. In the fourth measure, I incorporate small-bedroom detached units, which are also commonly used interchangeably for renting and owning.

- Integration1: $\frac{\text{Attached, 1-2 unit}}{\text{Total housing units}}$
- Integration2: $\frac{\text{Attached, 1–4 unit}}{\text{Total housing units}}$
- Integration3: $\frac{\text{Attached, 1–4 unit + 1–2 BR Detached}}{\text{Total housing units}}$
- Integration4: $\frac{\text{Attached, 1–4 unit + 1–2 BR Detached + Mobile}}{\text{Total housing units}}$

I examine whether the price effect of down payment relaxation varies with market integration by running RDD specification that interact the treatment indicator with each integration measure. The results are reported in Table 6. The interaction term is consistently negative and statistically significant, indicating that the house price effect diminishes as the level of housing market integration increases. Additionally, the main treatment coefficient is positive and significant, suggesting that price impacts are strongest in the least integrated markets.

To validate these findings, I divide the sample within the optimal bandwidth into quartiles based on the distribution of the integration measure and re-estimate the RDD specification separately for each integration quartile. The resulting coefficients, plotted in Figure 8, reveal a clear pattern: the impact on house prices is highest in the first quartile and declines monotonically across quartiles, consistent with the hypothesis that integration moderates price responses.

5 Conclusion

This paper investigates the impact of relaxing down payment constraints on mortgage originations and house prices by exploiting a discontinuity at geographical level in borrower eligibility for low down payment programs - HomeReady and Home Possible. Using a regression discontinuity design, I find that relaxing the down payment requirement significantly increased high LTV mortgage originations and led to economically meaningful house price appreciation.

The effects on high LTV originations are concentrated in specific market segments: mortgage origination responses exhibit an inverse U-shaped relationship with the local price-to-rent ratio, with the largest effects in moderately priced housing markets. Additionally, house price effects are strongest in markets with low integration between rental and ownership segments, where the increase in homeownership demand is less likely to be offset by reduced investor demand. Overall, the findings suggest that targeted down payment assistance programs can expand access to mortgage credit and influence housing market dynamics. However, their effectiveness depends critically on local housing affordability conditions and the impact on house price depends on the degree of integration between rental and owned housing market.

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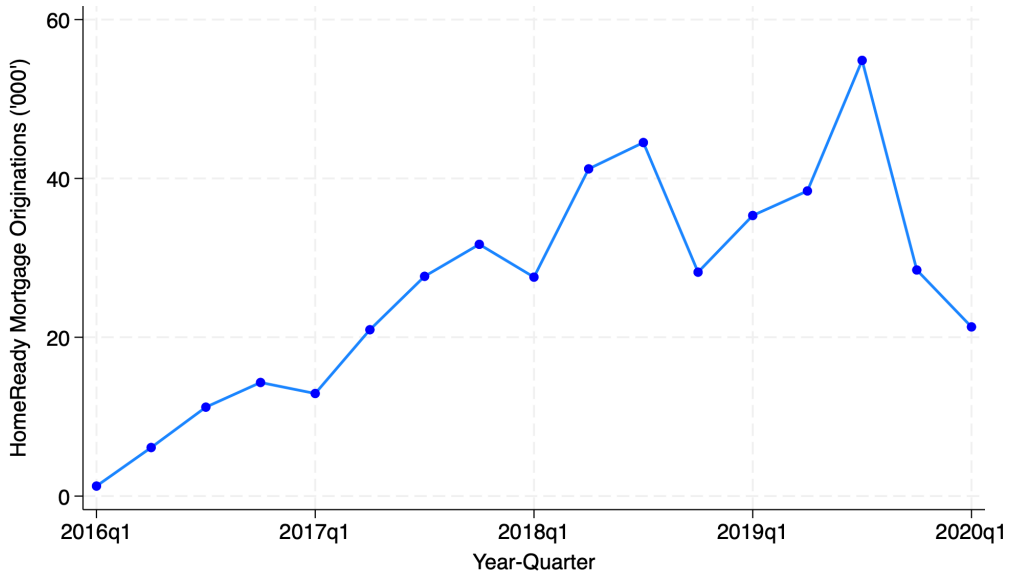
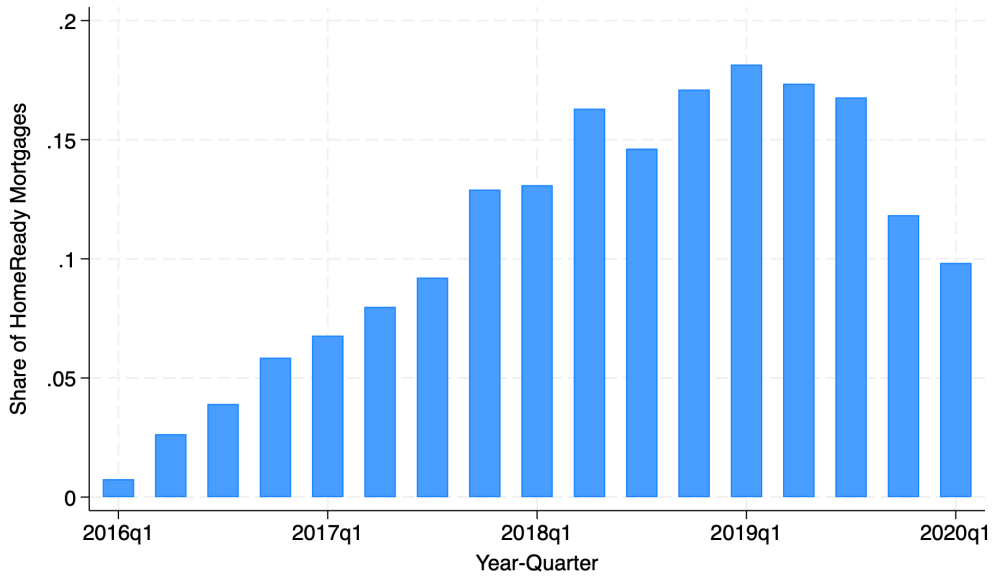


(a) HomeReady Originations



(b) Share of HomeReady Originations

Figure 1: Evolution of HomeReady Program

Notes: Figure (a) plots the quarter-wise number of mortgages originated under HomeReady Program. Figure (b) plots the quarter-wise number mortgages originated under HomeReady Program as share of total mortgages originated by Fannie Mae

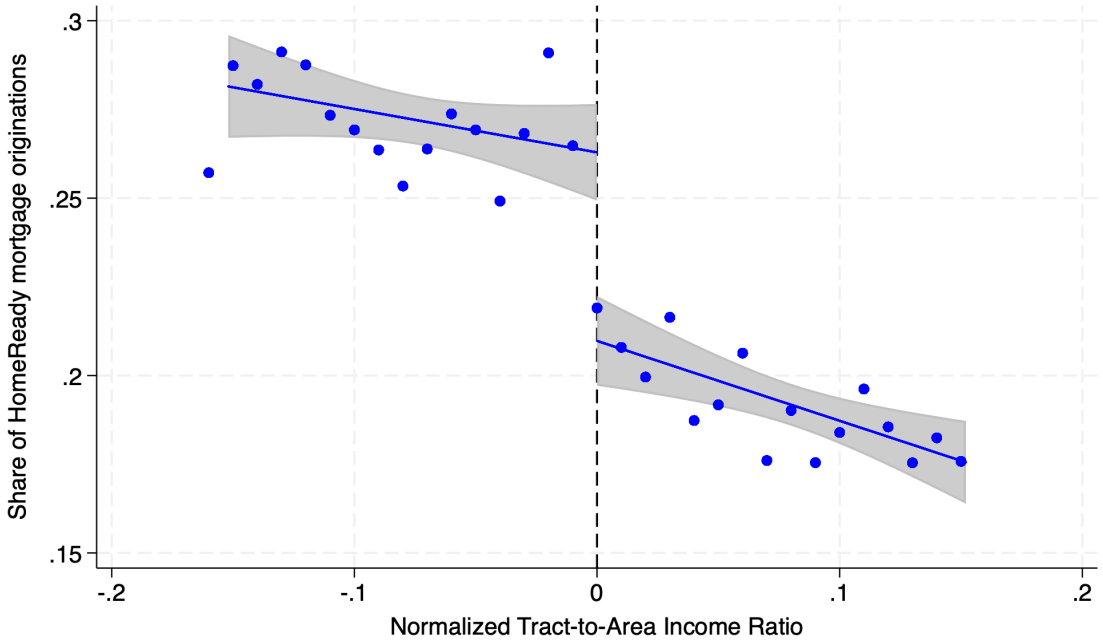
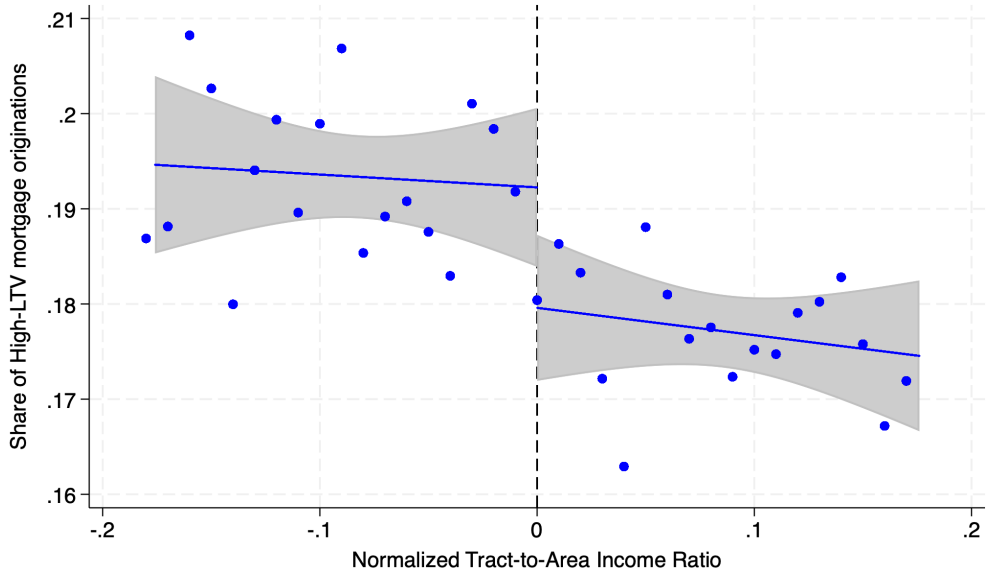
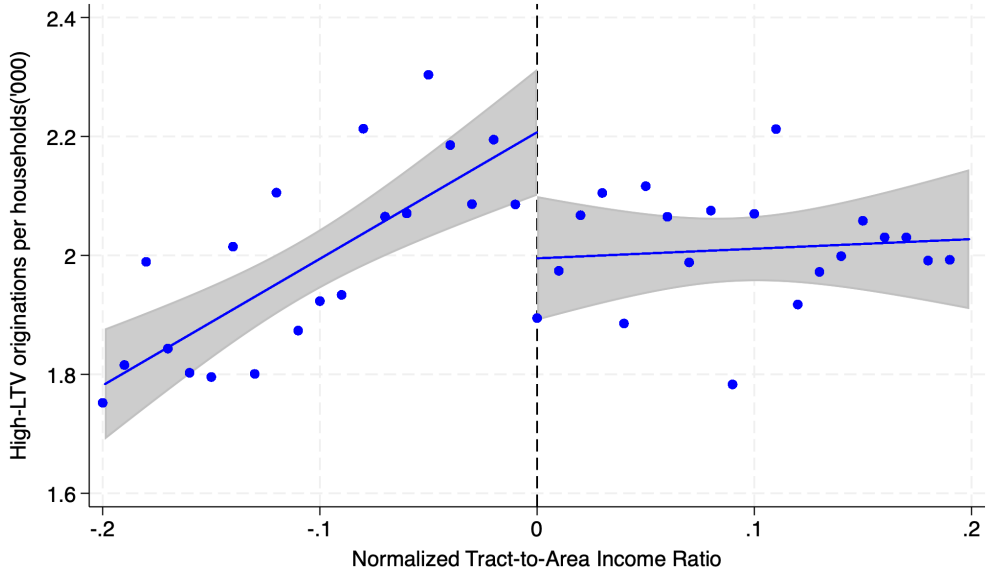


Figure 2: Discontinuity in the share of HomeReady Mortgages at threshold

Notes: The figure plots the residualized values in the RDD specification after controlling for all variables other than tract to income ratio. The residuals values are estimated separately for the right and left of the cutoff within the optimal bandwidth. The dots represent binned mean of the residual values. Tract to income ratio is normalized by subtracting the cutoff value.



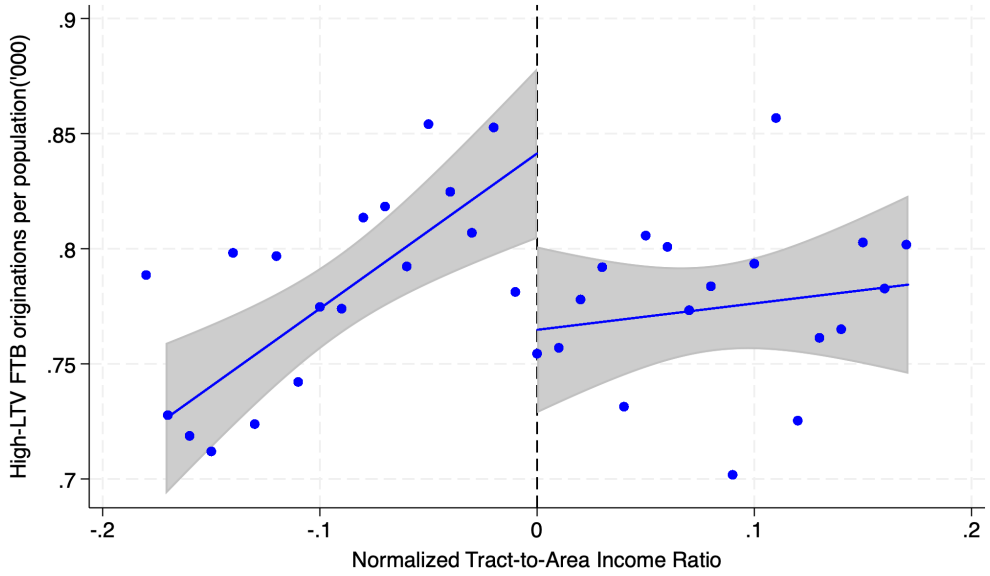
(a) Share of High LTV Mortgage Originations



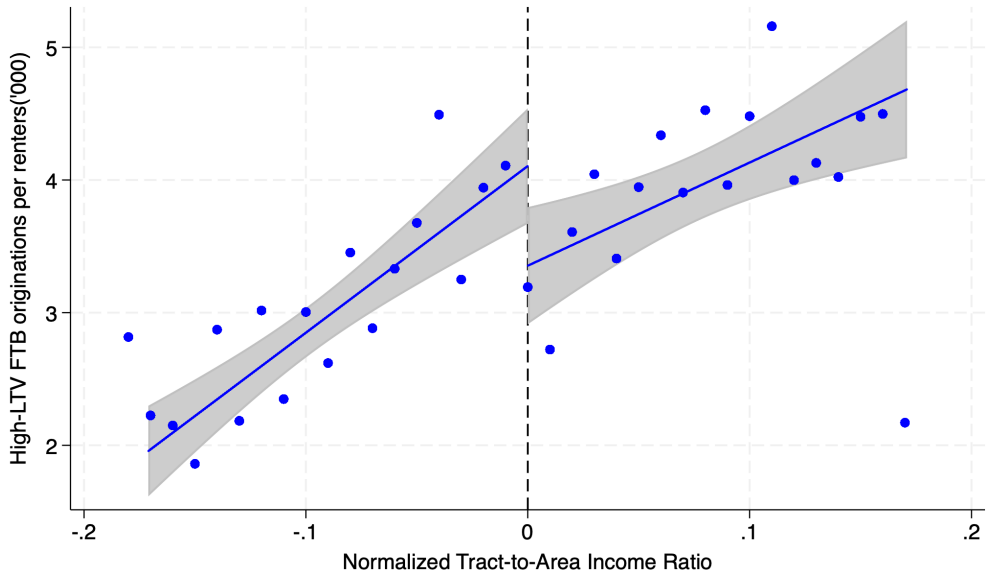
(b) High LTV Originations per households(in thousands)

Figure 3: Impact on High LTV Mortgage Originations

Notes: The figure plots the residualized values in the RDD specification after controlling for all variables other than tract to income ratio. The residuals values are estimated separately for the right and left of the cutoff within the optimal bandwidth. The dots represent binned mean of the residual values. Tract to income ratio is normalized by subtracting the cutoff value.



(a) Share of First time buyer High LTV Mortgage Originations



(b) First time buyer High LTV Originations per Rental households(in thousands)

Figure 4: Impact on First time buyer High LTV Mortgage Originations

Notes: The figure plots the residualized values in the RDD specification after controlling for all variables other than tract to income ratio. The residuals values are estimated separately for the right and left of the cutoff within the optimal bandwidth. The dots represent binned mean of the residual values. Tract to income ratio is normalized by subtracting the cutoff value.

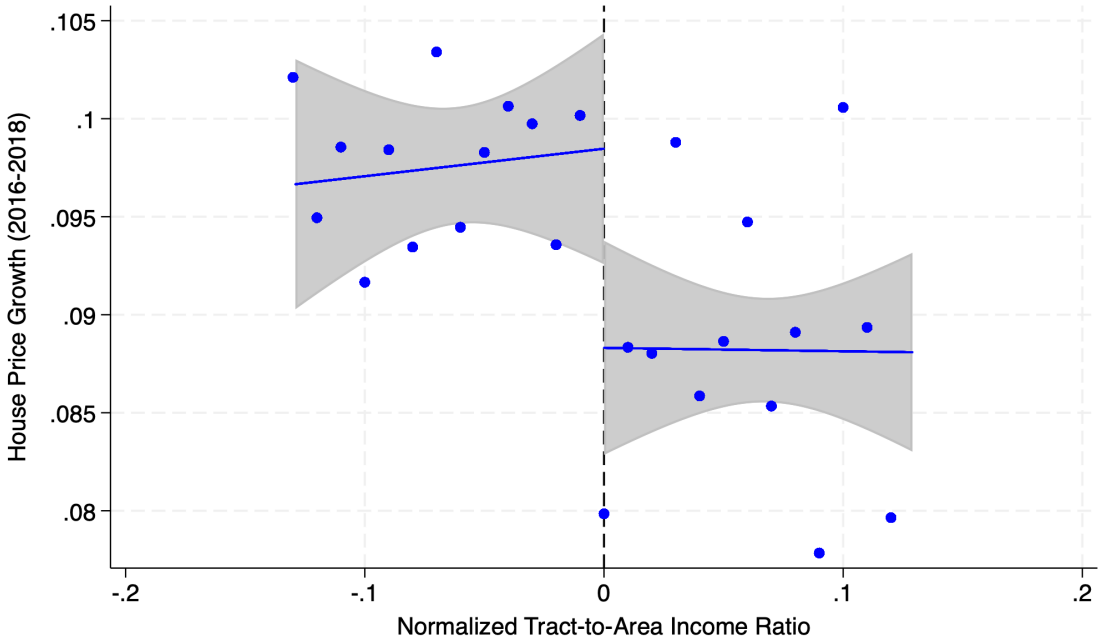
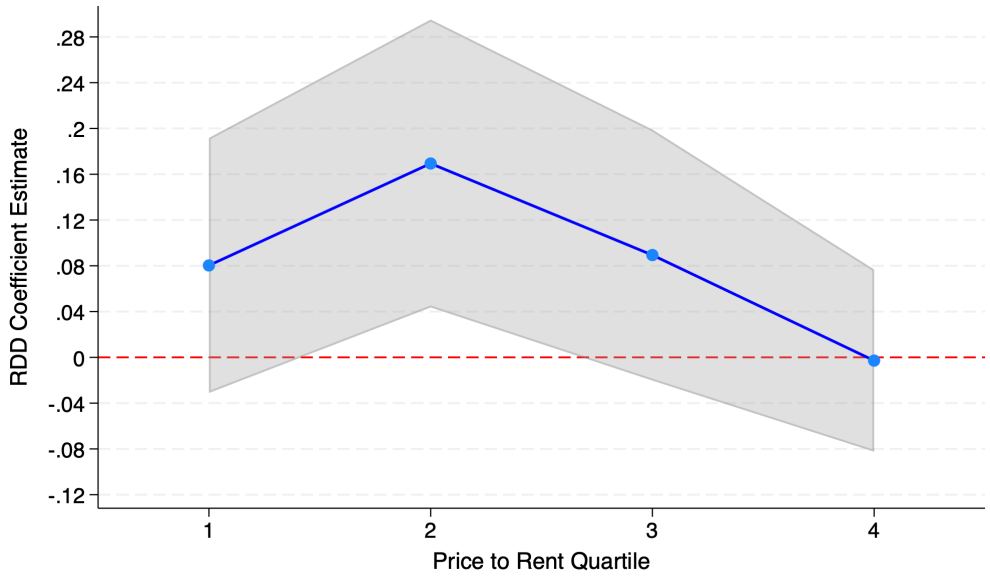
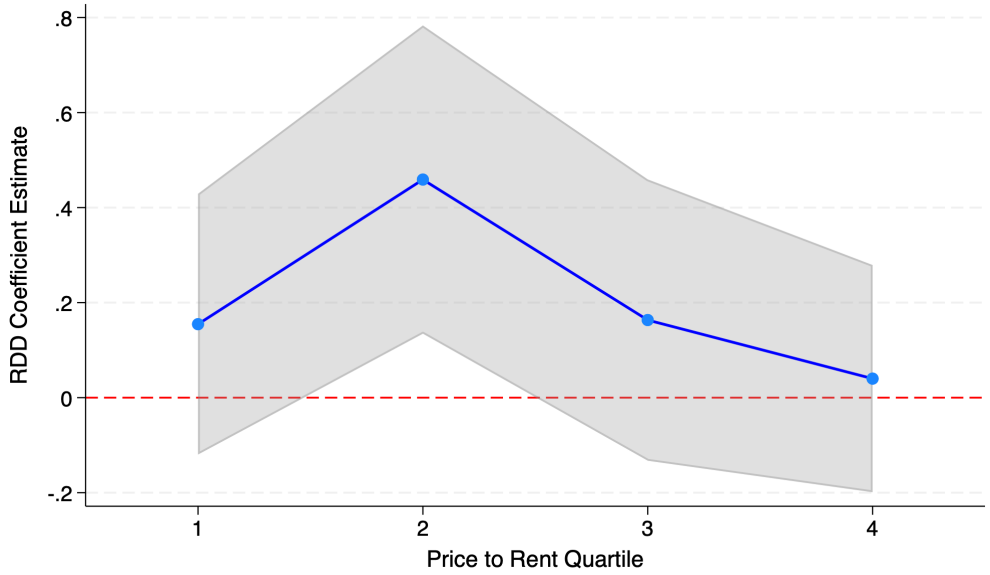


Figure 5: Impact on House Price Growth from 2016 to 2018

Notes: The figure plots the residualized values in the RDD specification after controlling for all variables other than tract to income ratio. The residuals values are estimated separately for the right and left of the cutoff within the optimal bandwidth. The dots represent binned mean of the residual values. Tract to income ratio is normalized by subtracting the cutoff value.



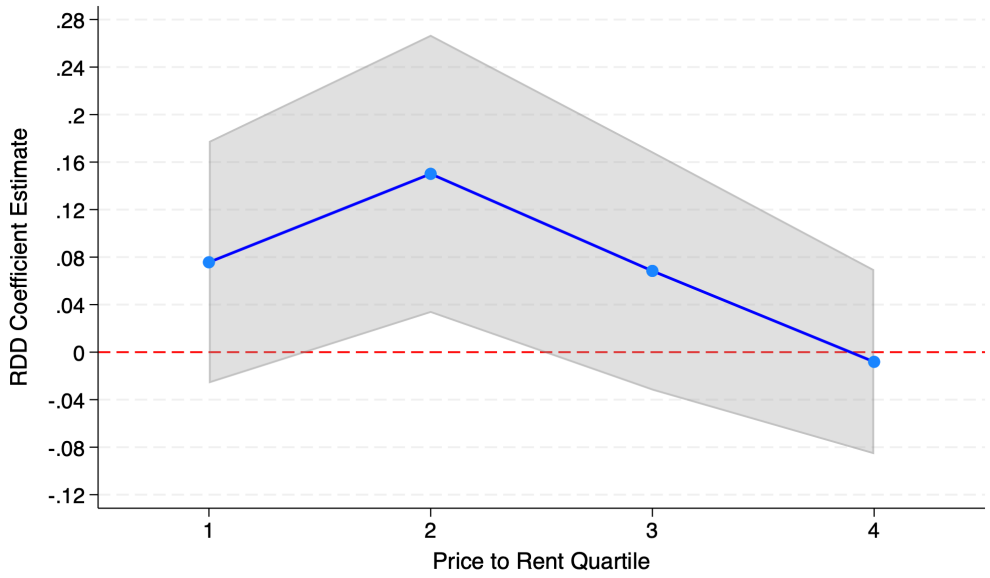
(a) High LTV Mortgage Originations per population(in thousdands)



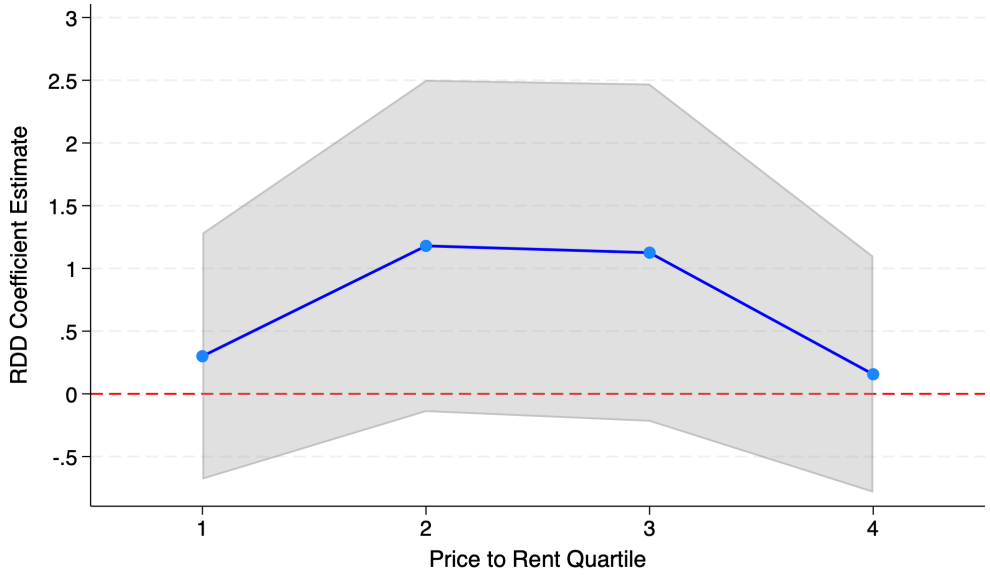
(b) High LTV Mortgage Originations per households(in thousdands))

Figure 6: High LTV Originations: Heterogeneity by Price-to-Rent

Notes: The figure displays RDD estimates and their corresponding 95% confidence intervals across quartiles of the price-to-rent ratio. Census tracts are divided into four subsamples based on the quartile distribution of the price-to-rent ratio. For each quartile, a separate RDD specification is estimated for optimal bandwidth, and the resulting coefficient is plotted against the corresponding quartile.



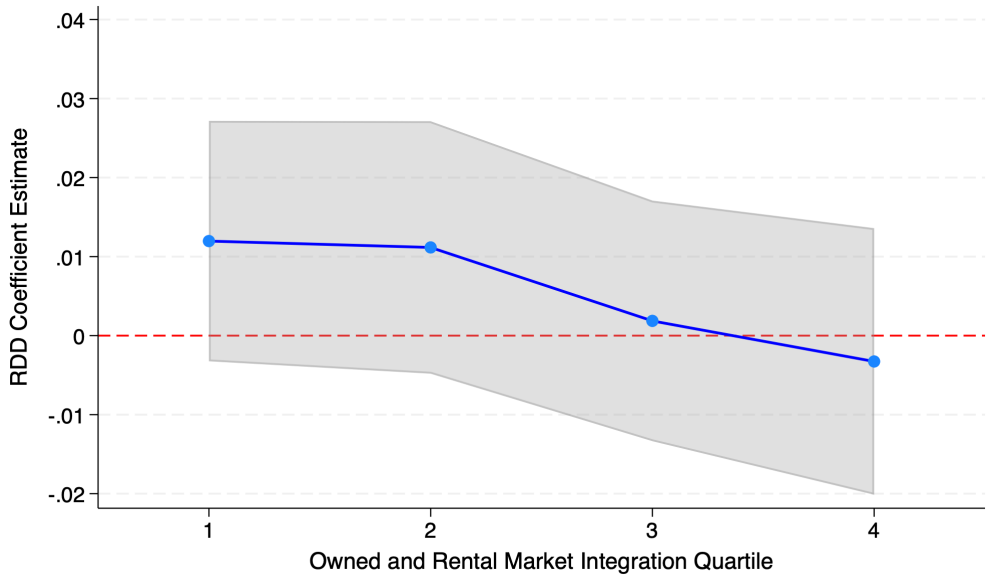
(a) FTB HLTV Mortgage Originations per population(in thousdands)



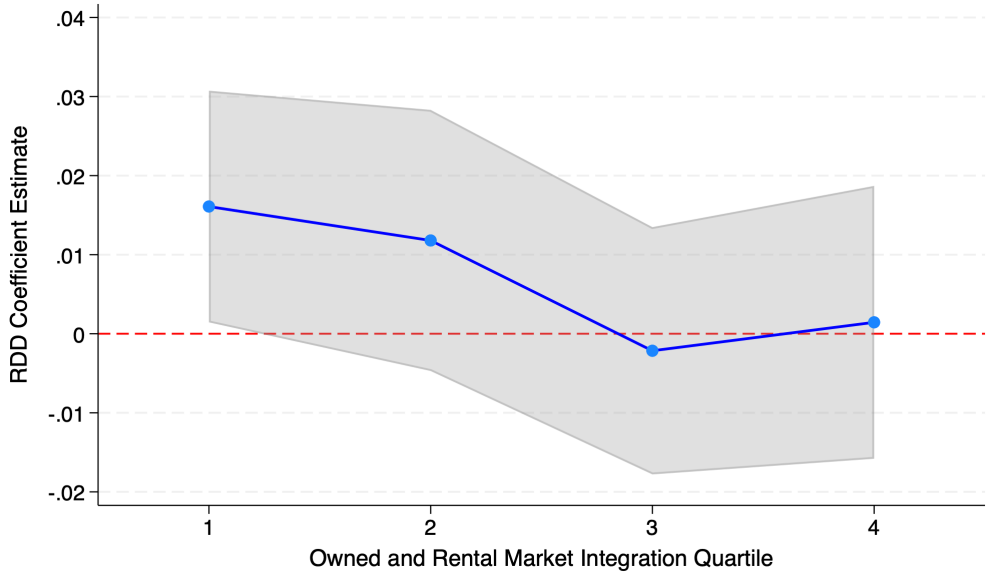
(b) FTB HLTV Mortgage Originations per Renters(in thousdands))

Figure 7: First time buyer High LTV Originations: Heterogeneity by Price-to-Rent

Notes: The figure displays RDD estimates and their corresponding 95% confidence intervals across quartiles of the price-to-rent ratio. Census tracts are divided into four subsamples based on the quartile distribution of the price-to-rent ratio. For each quartile, a separate RDD specification is estimated for optimal bandwidth, and the resulting coefficient is plotted against the corresponding quartile.



(a) Integration1



(a) Integration4

Figure 8: House Price Growth: Heterogeneity by Housing Market Integration

Notes: The figure displays RDD estimates of impact of downpayment constraint on house price growth and their corresponding 95% confidence intervals across quartiles of housing market integration. Census tracts are divided into four subsamples based on the quartile distribution of the housing market integration. For each quartile, a separate RDD specification is estimated for optimal bandwidth, and the resulting coefficient is plotted against the corresponding quartile.

Table 1: High LTV Mortgage Originations

	High-LTV Loans	High-LTV Loans	High-LTV Loans	High-LTV Loans
	All loans	Population	Households	Adult Population
	(1)	(2)	(3)	(4)
Panel A: Optimal Bandwidth				
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0152**	0.0919***	0.218***	0.114***
	(0.00652)	(0.0295)	(0.0780)	(0.0391)
Control Mean	0.185	0.868	2.024	1.19
Bandwidth	0.146	0.174	0.199	0.176
Observations	8,165	9,706	11,116	9,831
R-squared	0.415	0.447	0.447	0.453
Panel B: Bandwidth-0.1				
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0121	0.0910**	0.248**	0.116**
	(0.00805)	(0.0395)	(0.112)	(0.0526)
Control Mean	0.173	0.805	1.809	1.112
Observations	5,569	5,569	5,569	5,569
R-squared	0.435	0.465	0.473	0.470
Panel C: Bandwidth-0.2				
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0167***	0.0842***	0.218***	0.106***
	(0.00556)	(0.0276)	(0.0777)	(0.0366)
Control Mean	0.18	0.888	2.038	1.225
Observations	11,166	11,166	11,166	11,166
R-squared	0.394	0.433	0.446	0.440

Notes: Table presents the results of the effect of relaxing downpayment constraint on high LTV mortgage originations using RDD estimates of equation 1 at the tract level. Panel A restricts sample within the optimal bandwidth, while Panel B and C restricts the sample within bandwidths of 0.1 and 0.2 from the cutoff respectively. The dependent variable is high LTV (LTV greater than 95%) mortgage originations (only purchase loans) by Fannie Mae and Freddie Mac for year 2018. High LTV originations are normalized by dividing it by all originations in column (1), total population in column (2), households in column (3) and adult population in column(4). All population and household figures are in thousands. $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carries a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Table 2: First-Time Buyer High LTV Mortgage Originations

	FTB HLTV Loans	FTB HLTV Loans	FTB HLTV Loans	FTB HLTV Loans
	All loans	Rental Households	Households	Population
	(1)	(2)	(3)	(4)
Panel A: Optimal Bandwidth				
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0128*	0.795**	0.0791***	0.186**
	(0.00651)	(0.327)	(0.0273)	(0.0749)
Control Mean	0.163	3.734	0.77	1.765
Bandwidth	0.134	0.171	0.171	0.182
Observations	7,493	9,540	9,540	10,162
R-squared	0.385	0.360	0.433	0.436
Panel B: Bandwidth-0.1				
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0160***	0.781**	0.0744***	0.192***
	(0.00533)	(0.325)	(0.0253)	(0.0711)
Control Mean	0.154	3.584	0.796	1.808
Observations	11,166	11,166	11,166	11,166
R-squared	0.361	0.334	0.418	0.432
Panel C: Bandwidth-0.2				
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0103	1.269***	0.0712*	0.194*
	(0.00762)	(0.450)	(0.0364)	(0.103)
Control Mean	0.152	2.591	0.723	1.619
Observations	5,569	5,569	5,569	5,569
R-squared	0.402	0.354	0.447	0.457

Notes: Table presents the results of the effect of relaxing downpayment constraint on first-time buyer(FTB) high LTV mortgage originations using RDD estimates of equation 1 at the tract level. Panel A restricts sample within the optimal bandwidth, while Panel B and C restricts the sample within bandwidths of 0.1 and 0.2 from the cutoff respectively. The dependent variable is high LTV (LTV greater than 95%) mortgage originations (only purchase loans) by Fannie Mae and Freddie Mac for year 2018. High LTV originations are normalized by dividing it by all originations in column (1), rental households in column (2), households in column (3) and total population in column(4). All population and household figures are in thousands. $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carry a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Table 3: Effect on House Price

	House Price Growth (2016-18)			
	(1)	(2)	(3)	(4)
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0105**	0.0118**	0.00819**	0.00572*
	(0.00421)	(0.00475)	(0.00391)	(0.00344)
Control Mean	0.0827	0.0904	0.0983	0.1
Observations	5,037	3,887	5,839	7,667
R-squared	0.452	0.457	0.450	0.436
Bandwidth	optimal(0.129)	0.1	0.15	0.2
MSA Fixed Effects	Yes	Yes	Yes	Yes

Notes: Table presents the results of the effect of relaxing downpayment constraint on house prices using RDD estimates of equation 1 at the tract level. The dependent variable is the growth in house price from 2016 to 2018, measured as the growth in FHFA HPI from 2016 to 2018. The sample is restricted to the optimal bandwitdh in column (1), bandwidths of 0.1 from cutoff in column (2), bandwidths of 0.15 from cutoff in column (3), and bandwidths of 0.2 from cutoff in column (4). $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carries a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Table 4: Effect on Loan Applications and Loan Rejection

	Loan Applications / Population	Loan Applications / Households	Denial Rates	Denial (Liquidity-I)	Denial (Liquidity -II)	Liquidity Denials / All Denials
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}[I_{cm} \leq 0.8]$	0.260	0.706	-0.996**	-0.355**	-0.368**	-1.628*
	(0.185)	(0.579)	(0.420)	(0.145)	(0.188)	(0.962)
Control Mean	7.9	17.62	24.27	2.822	3.869	13.91
Observations	10,858	9,309	12,299	11,836	9,258	9,388
R-squared	0.327	0.292	0.311	0.120	0.144	0.074
Bandwidth	0.195	0.167	0.222	0.213	0.166	0.178
MSA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table presents the results of the effect of relaxing downpayment constraint on loan applications and loan rejections using RDD estimates of equation 1 at the tract level based on HMDA dataset of loans purchased by Fannie Mae and Freddie Mac The dependent variable in column 1 is loan applications per population, column 2 is loan applications per household, column 3 is number of loan rejected as a share of loan applications, column 4 is number of loans rejected due to insufficient cash or collateral as the primary reason, as a share of loan applications, column 5 is number of loans rejected due to insufficient cash or collateral as any one of the reason, as a share of loan applications and column 6 is number of loans rejected due to insufficient cash or collateral as the primary reason, as a share of all loan rejections. The sample is restricted to the optimal RDD bandwitdh for each column. $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carries a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Table 5: Impact on HLTV Originations: Heterogeneity By Price-to-Rent

	High-LTV Loans	High-LTV Loans	High-LTV Loans	High-LTV Loans
	All loans	Population	Households	Adult Population
	(1)	(2)	(3)	(4)
$\mathbb{1}[I_{cm} \leq 0.8]$	-0.00600	-0.581***	-2.173***	-0.833***
	(0.0627)	(0.188)	(0.509)	(0.246)
$\mathbb{1}[I_{cm} \leq 0.8] \times \frac{P}{R}$	0.00349	0.0472***	0.168***	0.0673***
	(0.00481)	(0.0151)	(0.0413)	(0.0198)
$\mathbb{1}[I_{cm} \leq 0.8] \times (\frac{P}{R})^2$	-0.000103	-0.000734***	-0.00261***	-0.00107***
	(8.74e-05)	(0.000281)	(0.000777)	(0.000371)
Observations	8,165	9,706	11,116	9,831
R-squared	0.416	0.448	0.449	0.454
Bandwidth	0.146	0.174	0.199	0.176
MSA Fixed Effects	Yes	Yes	Yes	Yes

Notes: Table presents the results of the heterogeneous effect of relaxing downpayment constraint on high LTV mortgage originations using RDD estimates of equation 1 at the tract level. The heterogeneity is evaluated based on the price-to-rent ratio, defined as the ratio of the median house price to the median rent in the metropolitan statistical area (MSA) where each census tract is located. The dependent variable is high LTV (LTV greater than 95%) mortgage originations (only purchase loans) by Fannie Mae and Freddie Mac for year 2018. High LTV originations are normalized by dividing it by all originations in column (1), total population in column (2), households in column (3) and adult population in column(4). All population and household figures are in thousands. $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carries a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Table 6: Impact on House Price: Heterogeneity By Housing Market Integration

	House Price Growth (2016-18)			
	(1)	(2)	(3)	(4)
$\mathbb{1}[I_{cm} \leq 0.8]$	0.0159***	0.0164***	0.0171***	0.0204***
	(0.00467)	(0.00491)	(0.00508)	(0.00690)
$\mathbb{1}[I_{cm} \leq 0.8] \times Integration1$	-0.0484***			
	(0.0177)			
$\mathbb{1}[I_{cm} \leq 0.8] \times Integration2$		-0.0351**		
		(0.0149)		
$\mathbb{1}[I_{cm} \leq 0.8] \times Integration3$			-0.0332**	
			(0.0143)	
$\mathbb{1}[I_{cm} \leq 0.8] \times Integration4$				-0.0246*
				(0.0137)
Observations	5,037	5,037	5,037	5,037
R-squared	0.453	0.454	0.454	0.453
MSA Fixed Effects	Yes	Yes	Yes	Yes

Notes: Table presents the results of the heterogeneous effect of relaxing downpayment constraint on house price growth using RDD estimates of equation 1 at the tract level. The heterogeneity is evaluated based on housing market integration, defined as the share of housing units that can be either rented or owned (convertible units). Convertible units are defined progressively across four integration measures: Integration 1 includes attached single-unit houses; Integration 2 includes attached 1–4 unit houses; Integration 3 expands the definition to include both attached 1–4 unit houses and detached houses with 1–2 bedrooms; and Integration 4 further adds mobile homes to the set of convertible units. The dependent variable is the growth in house prices from 2016 to 2018, measured as the growth in FHFA HPI from 2016 to 2018. $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carries a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Appendix

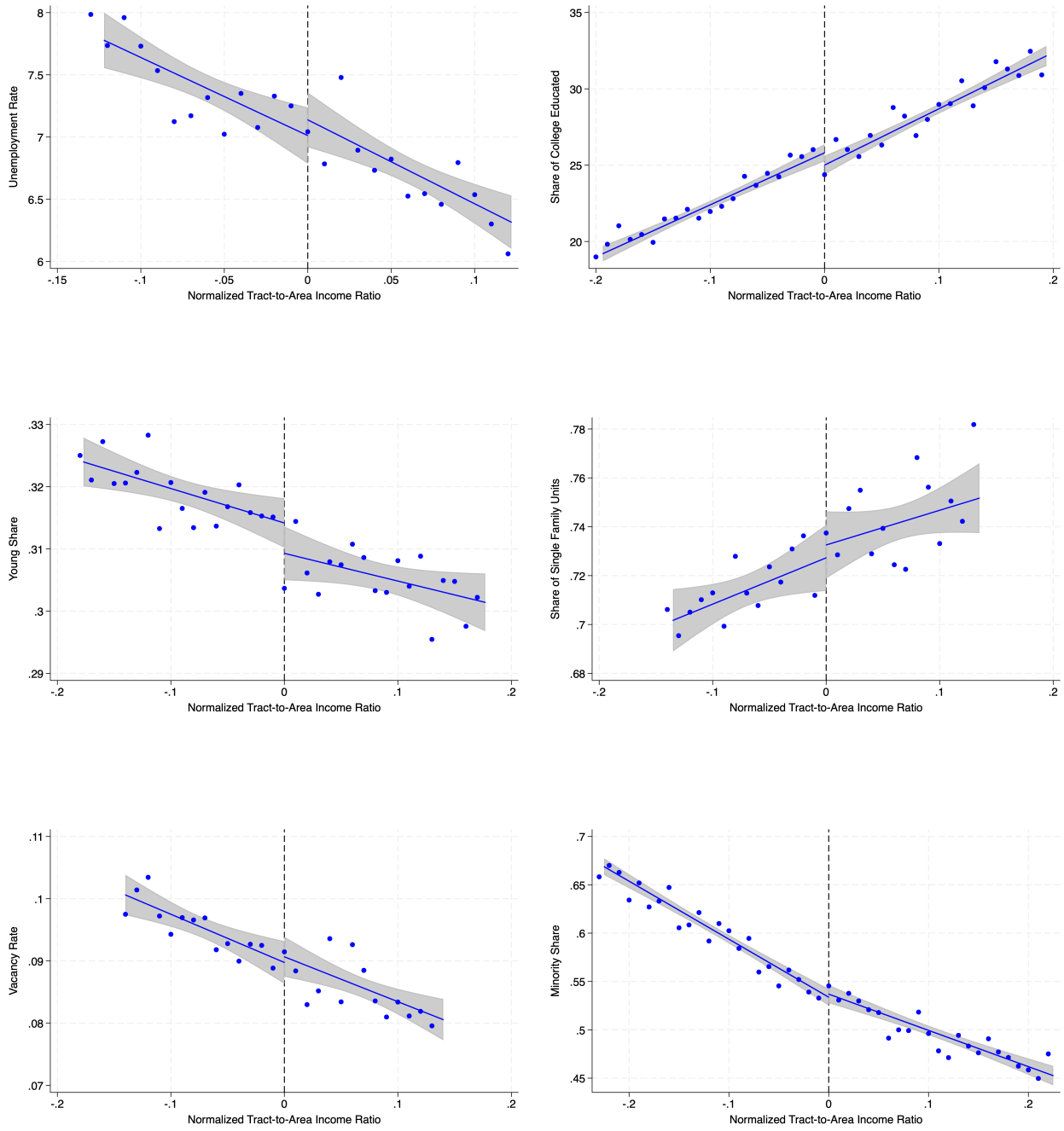


Figure A.I: The figure plots the residualized values in the RDD specification after controlling for MSA fixed effects. The residuals values are estimated separately for the right and left of the cutoff within the optimal bandwidth. The dots represent binned mean of the residual values. Tract to income ratio is normalized by subtracting the cutoff value

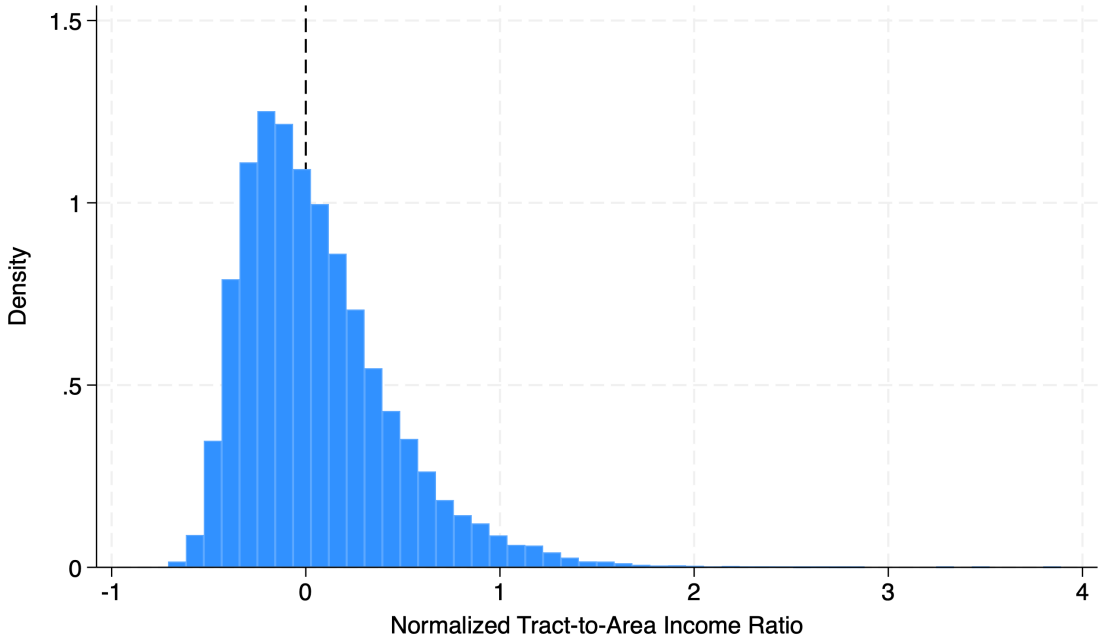


Figure A.II: Histogram

Table A.I: RDD Estimates of Co-variates

	Unemployment Rate (1)	College Educated (2)	Young (3)	Single Family Units (4)	Vacancy Rate (5)	Minority Share (6)
Treated	-0.132	0.823*	0.00503	-0.00539	-0.000942	-0.00287
	(0.168)	(0.433)	(0.00309)	(0.0102)	(0.00247)	(0.00670)
Control Group	7.138	25.04	0.309	0.733	0.0906	0.536
Observations	6,874	10,804	9,980	7,613	7,899	12,567
R-squared	0.284	0.381	0.149	0.077	0.346	0.427
Bandwidth	0.122	0.194	0.177	0.135	0.14	0.225
MSA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table presents the results of the effect of relaxing downpayment constraint on covariates using RDD estimates of equation 1 at the tract level. $\mathbb{1}[I_{cm} \leq 0.8]$ is a dummy variable that carries a value of one for low-income census tracts, which are tracts with median income below or equal to 80% of Area Median Income (AMI). For each regression, the outcome mean for the control group (tracts with income above 80% AMI) is also shown. The specification includes tract-level controls for economy, demographics, and housing, as well as MSA fixed effects. The errors are clustered at the tract level and adjusted for heteroscedasticity.*, ** and *** represent 10%, 5%, and 1% levels of significance.

Table A.II: Composition of Housing Structures by tenure status

Structure Type	Always Owner	Always Rental	Own/Rent
Detached, 1 unit	73.5%	2.4%	24.1%
Attached, 1–4 units	**23.7%**	**41.9%**	**34.5%**
Apartment, 5–19 units	4.1%	78.1%	17.8%
Apartment, 20–49 units	4.6%	77.2%	18.2%
Apartment, 50+ units	7.4%	70.5%	22.2%

Notes: This table provides the shares of housing units which have remained always owner, always rental and either owned/rental for each housing structure category