CFPB Office of Research Working Paper Series

Mortgages for Second Residences and Housing Markets

Zachary Blizard, Thomas S. Conkling, Georgia Ronis von Helms

2025-03

Mortgages for Second Residences and Housing Markets*

Zachary Blizard† Thomas S. Conkling† Georgia Ronis von Helms†

April 12, 2025

Abstract

Mortgage credit plays an important role in purchases of second residences, such as vacation homes or second homes. This paper documents unique features of second residence mortgages, and explores whether and how policies for such mortgages could affect not only second residence homebuyers, but potentially primary residence buyers through the availability of housing in local markets. We show that second residence loans are geographically concentrated in particular counties—much more so than mortgages for investment properties—meaning that policies affecting second residence mortgages could have large effects on local housing markets. We study these dynamics through a 2022 policy change that sharply increased borrowing costs for second residence mortgages, by $1,260 per year on average. For the second residence mortgages most strongly affected, we estimate that the policy reduced lending by 23 percent. At the local market level, overall mortgage lending for home purchases fell by approximately 5 percent in counties with many second residence loans. Despite these large effects, we find no evidence of an offsetting increase in lending for primary residences, potentially due to unique features of the markets or properties for which second residences are common.

1 Introduction

Mortgage credit plays an important role in purchases of second residences, such as vacation homes or second homes, with roughly half purchased using a mortgage.[1] But, compared to primary residences and investment properties, the role of mortgage policy in the second residence market has been relatively understudied, particularly in understanding how such policies could affect local housing markets. Prior work has often analyzed second residences and investment properties collectively, in part because comprehensive data distinguishing second residence mortgages from other loans only became available in 2019 (Liu et al., 2019). This paper documents unique features of second residence mortgages, and explores whether and how policy changes in this market could affect not just prospective second residence homebuyers but also local housing markets more broadly.

*The views expressed are those of the authors and do not necessarily represent the views of the Consumer Financial Protection Bureau or the United States. We thank Octavian Carare, Judith Ricks, and seminar participants at the CFPB for helpful comments.

†Consumer Financial Protection Bureau. Corresponding author: thomas.conkling@cfpb.gov.

[1]Vacation Home Counties Report June 2021, National Association of Realtors, https://www.nar.realtor/sites/default/files/documents/2021-vacation-home-counties-report-06-15-2021.pdf.

In contrast to loans for investment properties, second residence loans generally must be obtained by an individual borrower rather than a business entity, the borrower cannot use expected rental income on the property to qualify for the loan, and the borrower must live at the property for some portion of the year.[2] As a result, these properties may be used as short-term rentals for part of the year, but generally cannot serve as rental housing stock for full-time residents.[3] As such, the presence of second residences could reduce the number of housing units available for full-time residents in a given market.

We show that second residence loans are geographically concentrated in particular counties—much more so than mortgages for investment properties—meaning that policy changes affecting second residence mortgages could have large effects on local housing markets. However, the dynamics of these local markets may differ from more typical housing markets due to a large share of non-resident owners or due to their unique locations, often near coastlines, lakes, forests, or mountains. We study these dynamics in the context of a 2022 policy change that substantially increased the prices of second residence loans.

We estimate that a fee increase announced by the Federal Housing Finance Agency (FHFA) in January 2022, which applied to second residence loans purchased by the Government Sponsored Enterprises (GSEs) on or after April 1st, 2022, had the direct effect of raising APRs on second residence purchase loans by 35 basis points, substantially increasing borrowing costs for prospective buyers. This in turn contributed to a substantial decline in mortgage lending for second residences, specifically an estimated 23 percent decline in originations for second residence loans with high loan-to-value (LTV) ratios.

Turning to local market effects, we focus on counties where the share of purchase mortgages that were for second residences was in the top decile pre-policy change—which we define as "treated" counties—where on average 32 percent of all purchase mortgages were for second residences, relative to 4 percent in all other counties.[4] Given the substantial changes in housing demand, home prices, and interest rates over the pandemic period, and potential unobservable differences across counties, we employ synthetic difference-in-differences methods to flexibly construct a control group for our treated counties and ensure parallel trends in the pre-policy period (Arkhangelsky et al., 2021). Using these methods, we estimate that the policy change reduced overall mortgage lending in treated counties by roughly 5 percent, with evidence of only a very small offsetting increase in investment loans and no evidence of any increase in lending for primary residences.

One stated goal of the fee increase was to "ensure access to credit for first-time homebuyers and low- and moderate-income borrowers," but we do not find evidence of a measurable impact of the fee increase on mortgage take-up by primary residence buyers.[5] There are several possible

[2]For examples of typical requirements for second residence borrowers, see the Freddie Mac Seller/Servicer Guide, `https://guide.freddiemac.com/app/guide/section/4201.12`, and the Fannie Mae Seller Guide, `https://selling-guide.fanniemae.com/sel/b2-1.1-01/occupancy-types#P741`.

[3]While prior literature has found that some borrowers misrepresent their occupancy status as owner-occupied (Elul, Payne and Tilson, 2023), our results suggest that many potential second residence buyers are unwilling or unable to switch their occupancy status in response to the policy change studied, as discussed in Section 1.1

[4]Within the top decile, the second residence share ranges from 20 to 74 percent.

[5]"FHFA Announces Targeted Increases to Enterprise Pricing Framework: Upfront Fee Adjustments for High

explanations for the lack of a measurable effect. These include market frictions, compositional changes in properties purchased, or the unique nature of markets with many second residences.

First, while direct effects of the fee increase on buyers of second residences may occur quickly, frictions in housing markets can delay or mitigate potential effects on home prices or sales.[6] Recent empirical work using data on home listings has highlighted the importance of the inflows and outflows of potential home buyers and sellers, where a decrease in housing demand from second residence buyers could result in a combination of lengthened time-to-sale for listed properties, rising inventory, withdrawn listings, or reduced new listings (Anenberg and Ringo, 2024; Badarinza, Balasubramaniam and Ramadorai, 2024; Ngai and Sheedy, 2024). In addition, within a county, the policy change could affect the composition or location of properties purchased by primary residence buyers, but not the overall number. This type of filtering in housing markets (Liu, McManus and Yannopoulos, 2022; Rosenthal, 2014; Sweeney, 1974) could provide benefits to primary residence buyers not captured by changes in the number of mortgages or number of purchases.

The unique features of counties with many second residences may also affect the local housing market dynamics. In these markets, much of the existing housing stock is owned by non-residents, who may have greater flexibility in deciding whether to offer their property for sale, for long- or short-term rental, or to wait for a better selling opportunity. Given that about half of second residences are purchased without a mortgage, the presence of competing cash buyers could also mitigate potential growth in purchases by primary residence buyers.

A related factor is that there could be meaningful market segmentation between properties sought by second residence buyers versus those sought by primary residence buyers and investors. Loans for second residences are common in coastal areas but make up the highest share of lending in rural areas outside of cities. They also have substantially higher average property values than primary residences. Demand from primary residence buyers for the properties and markets most affected by the fee increase could be limited if the properties' characteristics or locations make them poor matches relative to other available housing (including rentals). The properties could also have lower demand from investors, who tend to be most active in fast-growing metro areas with high income growth rates (Garriga, Gete and Tsouderou, 2023).

Overall, this paper aims to explore the role of second residences in housing markets and the implications of second residence mortgage policy. While the presence of second residences has the potential to limit housing availability for full-time residents, assessing the welfare implications of second residence mortgage policy is complicated by numerous factors, including the inherent cross-subsidization within the full GSE loan portfolio (Gete and Zecchetto, 2018; Goodman et al., 2022). In particular, Goodman et al. (2022) estimate that, prior to the 2022 fee increase studied here, the GSEs' returns on second residence loans provided a modest subsidy for other, higher risk loans that meet the GSEs' affordable housing goals, but that this cross-subsidy would increase substantially after the fee increase. As a result, changes in second residence mortgage policy can have direct

Balance Loans and Second Home Loans to Take Effect April 1, 2022," January 5, 2022, `https://www.fhfa.gov/news/news-release/fhfa-announces-targeted-increases-to-enterprise-pricing-framework`.

[6] Han and Strange (2015) provide a review of this literature.

effects in local mortgage markets as well as indirect market-wide effects through changes in available funds for cross-subsidies to first-time or lower income homebuyers.

In addition to the effects on mortgage markets and potential homebuyers, the presence of second residences may have complex effects on local markets and public finances. For example, prior research has found that second residences may effectively subsidize local governments as their owners pay full property taxes but consume less than full local services Anderson (2004, 2006), but also potentially lower neighborhood home values through reduced maintenance or investment (Ihlanfeldt and Yang, 2023). Further research is needed to understand the complex role of second residences in housing markets and the implications for mortgage and housing policy.

Section 2 describes the datasets used, while Section 3 provides background on the FHFA policy change and motivating evidence on the characteristics and distribution of second residence mortgages. Section 4 details the estimation methods. Section 5 reports the primary results, with additional robustness tests in Section 6.

1.1 Literature

In addition to the literature cited above, our results relate to prior empirical research on the role of investors and non-resident homebuyers in local housing markets, and evaluations of policies aimed at restricting such home purchases.

There has been substantial research on real estate investors. These include studies of investors' role in stabilizing local housing markets after the Great Recession, while also converting some owner-occupied housing into rental properties (Allen et al., 2018; Lambie-Hanson, Li and Slonkosky, 2022; Mills, Molloy and Zarutskie, 2019). Other studies have focused on the more recent growth and importance of small and medium-sized investors, who tend to purchase properties in the same local area that they operate in, and have been found to increase local home prices and rents, particularly on more affordable properties (Garriga, Gete and Tsouderou, 2023). These more recent investors tend to be most active in fast-growing metro areas with high income growth rates (Garriga, Gete and Tsouderou, 2023). While these studies highlight the importance of non-resident buyers on local housing markets, second residence homebuyers likely differ in several key respects. In contrast to the primarily corporate buyers of investment properties, second residences loans can only be originated by individuals, who must attest at origination that they will occupy the property for some part of the year and cannot use expected rental income from the property to qualify for their mortgage. While Elul, Payne and Tilson (2023) find evidence that some borrowers misrepresent their occupancy as owner-occupied to obtain lower interest rates, our finding of a substantial decline in overall lending due to the policy change indicates that many borrowers are unwilling to or cannot switch their occupancy status.[7] As shown below, second residence buyers differ substantially in the location of

[7]We cannot rule out occupancy fraud entirely, but to the extent that some borrowers are willing and able to misrepresent their occupancy status, they would likely already be obtaining primary residence loans rather than second residence loans, or would substitute into primary residence loans due to the policy change. We do not expect this willingness to change due to the policy, and a potential substitution effect into primary residence mortgages is inconsistent with our finding of no increased lending for such loans.

their purchases, and may have differing responses to mortgage policy and effects on local markets.

A related literature studies the impacts on local housing markets of residential property purchases by international homebuyers and investors (Badarinza and Ramadorai, 2018; Cvijanović and Spaenjers, 2021; Gorback and Keys, 2020; Favilukis and Van Nieuwerburgh, 2021; Li, Shen and Zhang, 2024; Sá, 2024). These studies largely focus on purchases in major metro areas in the U.S. and Europe—where purchases by international buyers are most common—and find that such purchases generally increase local property prices and may lead to some displacement of local residents. These purchases include a mix of purchases for investment properties, second residences, and primary residences, and are likely less reliant on or responsive to mortgage policy.

Most similar to our paper is a recent study by Amornsiripanitch et al. (2025) examining a GSE policy change affecting both investment and second residence loans. The authors find that a cap on GSE purchases of such loans implemented (and then rescinded) in 2021 led to an increase in interest rates for such mortgages, a shift away from selling such loans to the GSEs, a decline in house prices in affected counties, and spillover increases in rents. Our study confirms the interest rate increase due to the GSE purchase cap, but finds that the 2022 fee increase that we study led to a much larger price increase—but only for second residence loans. Given that second residence loans are more geographically concentrated than investment loans, the 2022 fee increase represents a potentially larger shock to a narrower set of heavily exposed local housing markets.

Our paper also contributes to studies of policy changes meant to restrict the purchase of properties by non-resident buyers. The existing literature often studies buyers of investment properties and second residences collectively, due in part to data limitations. Many existing studies of such government policy changes have focused on markets in Asia. Agarwal, Badarinza and Qian (2018) study a policy in Singapore that attempted to restrict loans for second properties by limiting their allowable Loan-to-Value (LTV) ratios. They found that LTV ratios fell, but overall lending for second properties was largely unaffected, as higher-risk borrowers replaced lower-risk borrowers. In contrast, we find an overall reduction in mortgage take-up by second residence buyers due to a price increase. Other papers explore the impact of policies in Southeast Asia which increased taxes on the resale of homes with short holding periods of between one and three years (Agarwal et al., 2022; Chi, LaPoint and Lin, 2020; Fu, Qian and Yeung, 2016). Agarwal et al. (2022) found one such policy in Hong Kong effectively restricted short-term speculation and reduced the presence of flippers in the market, but did not substantially impede house price growth.

Our contribution is to focus specifically on markets with a high concentration of second residences (rather than investment properties), and on a mortgage policy change targeted specifically at second residence buyers. By comparing our results to studies of investors alone or non-resident owners generally, we can assess whether such markets have unique dynamics and potentially different responses to policy interventions.

2 Data

2.1 Home Mortgage Disclosure Act

We use data from the Home Mortgage Disclosure Act (HMDA), specifically the CFPB's confidential Loan Application Record (LAR) datasets from 2018 to 2023. These datasets contain loan application-level records from all covered lenders in the United States.[8] The data include characteristics of the loan application, the loan applicant, and the property. Particularly useful for this study are the information on the occupancy-type of the property, which specifies whether the purchased property is the primary dwelling place of the buyer versus a second residence or investment property. Our primary sample is limited to first-lien originated purchase loans. We use refinance loans for robustness analyses in Section 6.

2.2 Census Bureau's American Community Survey

We use American Community Survey (ACS) 5-Year estimates from 2018 for data on the number of total housing units in local markets. The data are used to calculate the size of the housing stock in a given county, which is used as a normalization for some model specifications.

3 Background and Descriptive Evidence

3.1 Characteristics and geography of second residence mortgages

In this section, we first compare the characteristics of second residence loans and their borrowers to those of primary residence loans and investment loans. We then document the differences in where these loans are made, and the relative density of second residence loans in particular markets relative to investment loans.

Table 1 provides summary statistics on our HMDA analysis sample of first-lien purchase loans, which includes 1.1 million second residence loans originated from 2018 to 2023, compared with nearly 23.1 million primary residence loans and 2.1 million investment loans over the same time period. Borrower and property characteristics differ for these three types of loans. Borrowers of second residence loans tend to be older and have higher credit scores and incomes. Second residence loans tend to be larger and have lower debt-to-income ratios, lower interest rates, and lower rate spreads—a measure of APRs relative to the prime interest rate at loan origination. Furthermore, the property values associated with second residence loans are higher. Effectively all second residence and investment loans are conventional mortgages, while non-conventional loans (including FHA and VA loans) make up over 30 percent of primary residence loans. Another key difference between second residence loans and investment loans is that investment loans are

[8] We exclude mortgages in Connecticut from our panel and regression analyses that span multiple years, as the state's county definitions used for statistical purposes changed during 2022, See `https://www.federalregister.gov/documents/2022/06/06/2022-12063/change-to-county-equivalents-in-the-state-of-connecticut`.

Table 1: Descriptive Statistics by Occupancy Status, 2018-2023

	Primary mean	Secondary mean	Investment mean
Debt-to-Income Ratio	37.8	34.1	34.6
Age (Years)	41.0	52.2	47.1
Credit Score	732.4	768.5	761.6
Income ($)	114,263.7	235,466.3	187,059.9
Loan Amount ($)	315,491.2	359,279.1	289,047.6
Interest Rate (Percent)	4.4	4.1	5.5
Rate Spread (Percent)	0.5	0.4	1.0
Property Value ($)	389,249.0	507,145.5	439,976.8
Total Units	1.0	1.0	4.2
GSE Loans (Percent)	49.5	46.7	30.0
Conventional Loans (Percent)	68.9	99.9	99.9
Number of Loans	23,055,137	1,106,372	2,101,945

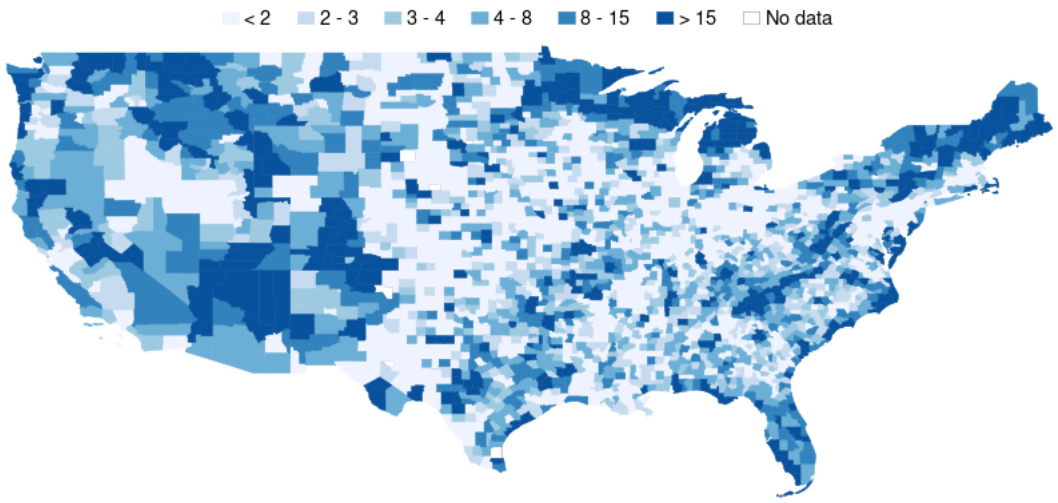
Note: The top and bottom 1 percent of monthly distributions for each variable has been winsorized. 2018-2023 confidential HMDA data, first-lien purchase loans.

often used to buy properties containing multiple units, while second residence loans are generally restricted to single-unit properties.

Second residence loans tend to be concentrated in particular counties within the United States, which differ from the most common locations for investment loans. Figure 1 shows a map of the county-level prevalence of second residence purchase loans in 2021. Second residence loans are more common in waterfront counties (including near oceans and lakes) and mountainous counties, as well as northern counties in New England and the upper Midwest. By contrast, Figure 2 shows the distribution on investment loans in 2021, which are generally spread more evenly across counties nationally. Plotting these shares together, Figure 3 shows that there is no strong correlation between investment and second residence shares of mortgages at the county level, with most counties having low shares of both loan types.

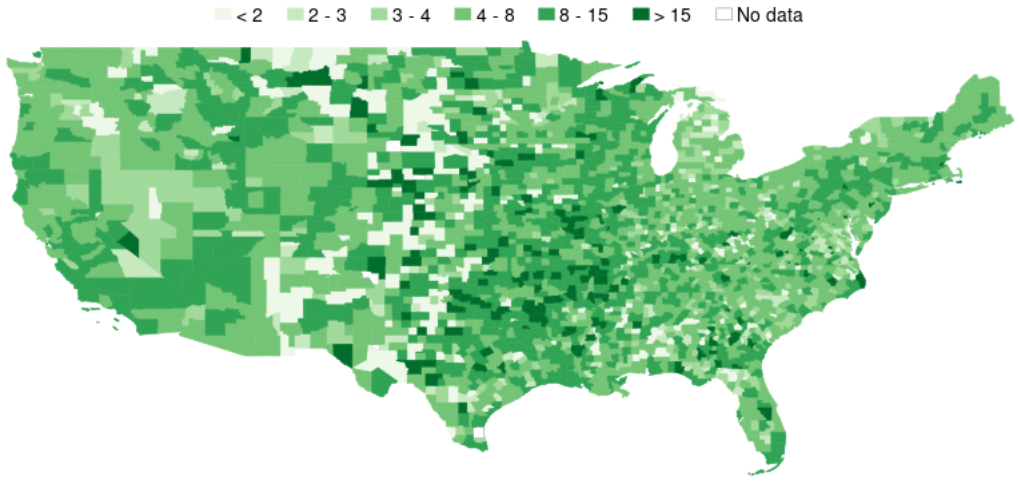
To highlight the differences in density of second residence and investment loans, Figure 4 compares the distribution across counties for the share of all purchase loans in 2021 that were for second residences versus investment properties. The figure shows that, relative to the share of investment loans, counties are more likely to have either a very low share (less than 5 percent) or a very high share (more than 20 percent) of second residence loans. In terms of the number of counties, investment loans made up at least 20 percent of purchase loans in only 52 counties, while second residence loans made up at least 20 percent of purchase loans in 309 counties. It is in these often rural counties with high shares of second residence loans that second residence mortgage policy may have the strongest potential effects.

Figure 1: Percentage of Purchase Mortgages for Second Residences, by County



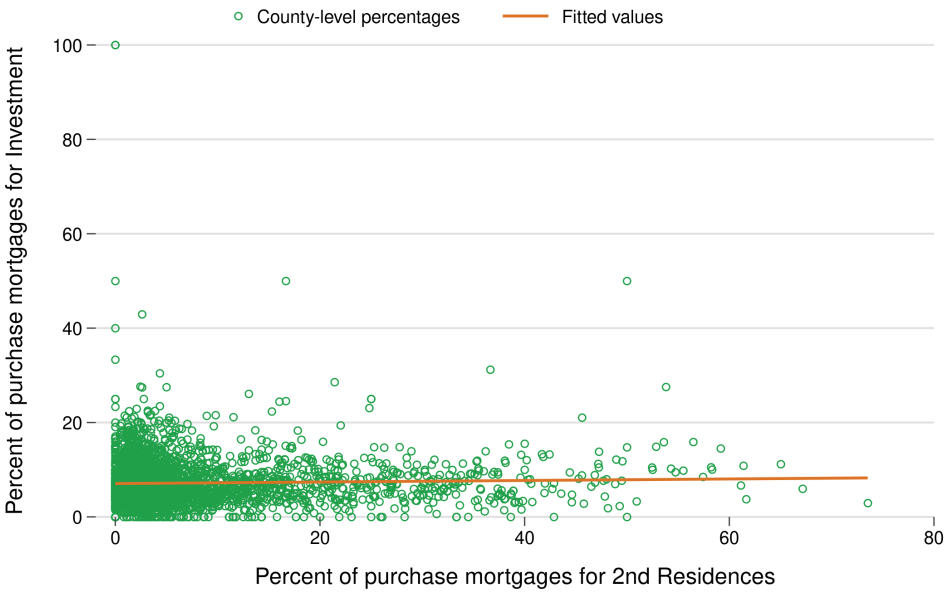
Note: 2021 conventional purchase originations, secondary residence occupancy type, HMDA data.

Figure 2: Percentage of Purchase Mortgages for Investment Properties, by County



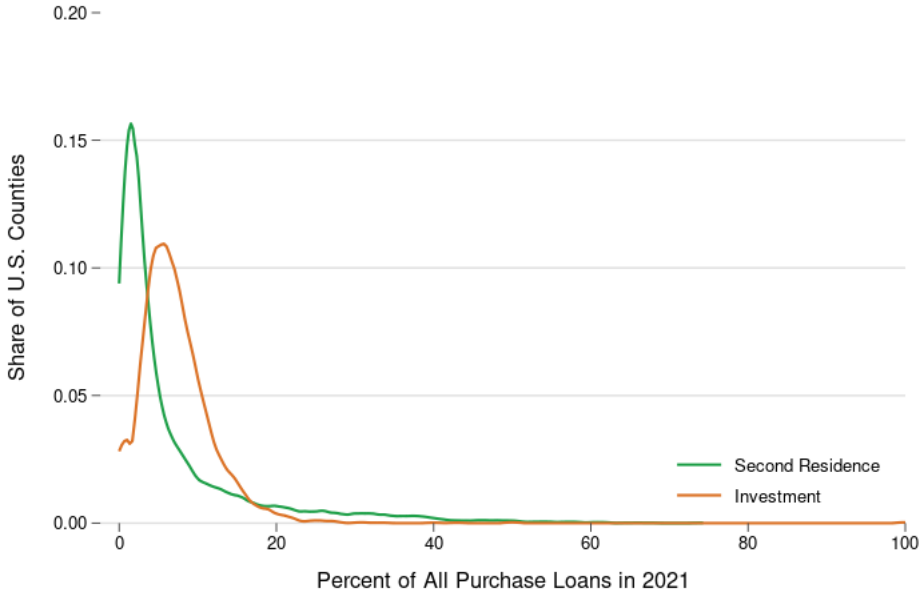
Note: 2021 conventional purchase originations, investment occupancy type, HMDA data.

Figure 3: County-Level Shares of Second Residence and Investment Loans



Note: 2021 confidential HMDA data. The percentage of all conventional purchase loans that are for second residences or investment properties in 2021 by county, with linear best fit line.

Figure 4: Distribution of Second Residence and Investment Loans Across U.S. Counties



Note: 2021 confidential HMDA data. The percentage of all purchase loans that are for second residences or investment properties in 2021 by county.

3.2 Policy change: Increased prices for second residence mortgages

The GSEs, specifically Fannie Mae and Freddie Mac, play a key role in the U.S. mortgage market, purchasing and securitizing a large share of U.S. mortgages while providing guarantees against credit risk. The GSEs charge an upfront fee when they purchase a loan, and these fees are regulated by the FHFA. On January 5th, 2022, the FHFA announced an increase in upfront fees for high balance loans and second residence loans guaranteed by the GSEs in order "to strengthen the Enterprises' safety and soundness and to ensure access to credit for first-time home buyers and low- and moderate-income borrowers." Upfront fees (as a percent of loan amount) increased by 1.125 to 3.875 percentage points for second residence loans, with the largest fee increases for loans with high LTV ratios.[9] The change took effect for loans purchased by the GSEs on or after April 1st, 2022. This fee change is quite large for loans with high LTV ratios, generally larger than the changes in recent GSE studies (Alexandrov, Conkling and Koulayev, 2024; Amornsiripanitch and Ricks, 2024; Hogan, 2016) and comparable in size to the fee change examined by Bhutta and Ringo (2021) for FHA loans. The upfront fees charged by the GSEs are often passed through to consumers in the form of interest rate changes that are paid by consumers over the life of a loan. We use rate spreads as our measure of price, which captures both interest rates and an annualized measure of fees paid by consumers at origination.

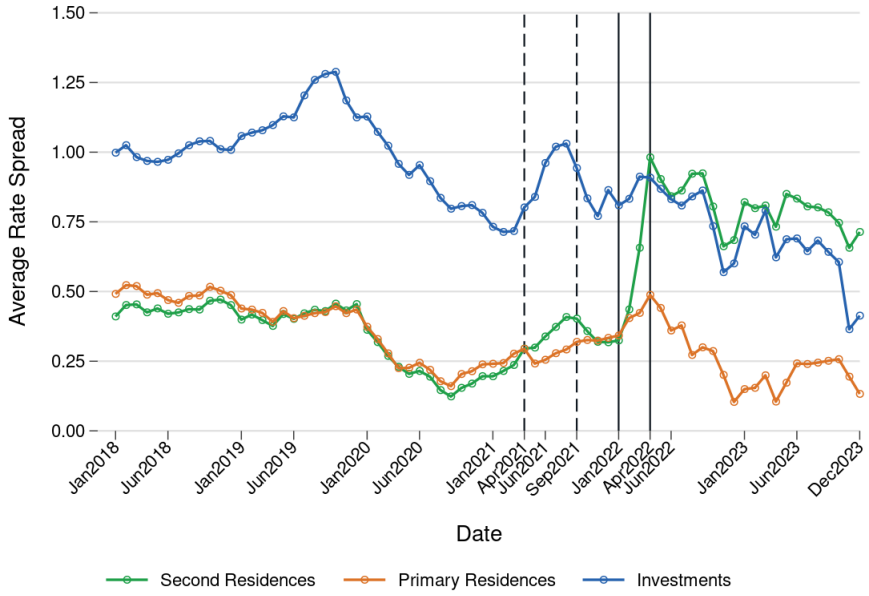
The GSE fee increase announced in January 2022 substantially increased prices of second residence loans. The change in price is clearly visible in Figure 5, which shows the average rate spread on GSE purchase mortgages for second residence loans, primary residence loans, and investment loans from January 2018 to December 2023. From January 2022 to April 2022, the average rate spread for second residence loans jumped from around 0.30 to around 1.00, raising prices for second residence loans to levels comparable with investment loans, which have historically been substantially more expensive than primary and second residence loans.

While this indicates a substantial direct effect on prices of GSE second residence loans, lender responses to the policy change may mitigate the effects on the second residence market as a whole. In the remainder of this section, we provide evidence that (a) a lower share of second residence loans were sold to the GSEs following the policy change, (b) the trends in overall originations suggest a decline in high-LTV second residence loan originations overall, relative to loans for primary residences, investment properties, and low-LTV second residence loans, and (c) as a result, the price of conventional second residence loans overall—not restricted to GSE loans—increased, but by a smaller amount.

Prior to 2020, approximately 50 percent of second residence purchase loans were GSE loans, as shown in Figure 6. This rose sharply to over 60 percent in 2020, potentially due to pandemic-induced market changes, and then returned to near 50 percent in 2021. Following the January 2022 announcement of the GSE fee increase on second residences, the GSE share of second residence

[9] "FHFA Announces Targeted Increases to Enterprise Pricing Framework: Upfront Fee Adjustments for High Balance Loans and Second Home Loans to Take Effect April 1, 2022," January 5, 2022, https://www.fhfa.gov/news/news-release/fhfa-announces-targeted-increases-to-enterprise-pricing-framework.

Figure 5: Average Rate Spread on GSE Purchase Mortgages, by Occupancy Type



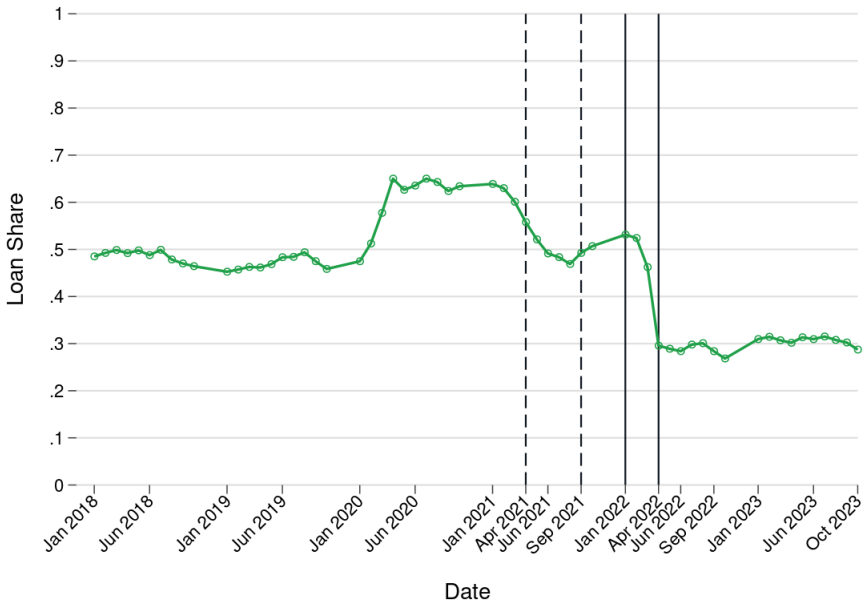
Note: 2018-2023 confidential HMDA data, conventional purchase mortgages purchased by the GSEs. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. Dashed vertical lines indicate the start and end dates of the GSE purchase cap policy affecting both second residence and investment property mortgages (Amornsiripanitch et al., 2025).

loans dropped sharply to approximately 30 percent by the April 2022 implementation date, and remained at that level through 2023. This substantial drop could reflect pure substitution by lenders, offering non-GSE loans instead of GSE loans, or may capture a true reduction in credit availability if reduced GSE originations are not fully offset by increased non-GSE originations.

To assess whether the fee increase led to a true decrease in credit for second residences, Figure 7 shows the count of conventional purchase loans—including GSE and non-GSE loans—by occupancy type and LTV range, normalized to equal 100 in December 2021. Each of these categories generally follows a seasonal pattern with more lending in the summer, and less lending in winter. The trends for second residence loans do not perfectly follow those of other loan categories, but generally fall within the range of the other loan categories prior to the fee increase. However, at the April 2022 implementation date, lending for high-LTV second residence loans falls substantially below all other loan categories. This suggests that the fee increase may have reduced credit supply for high-LTV second residence loans, rather than just shifting GSE lending to non-GSE lending.

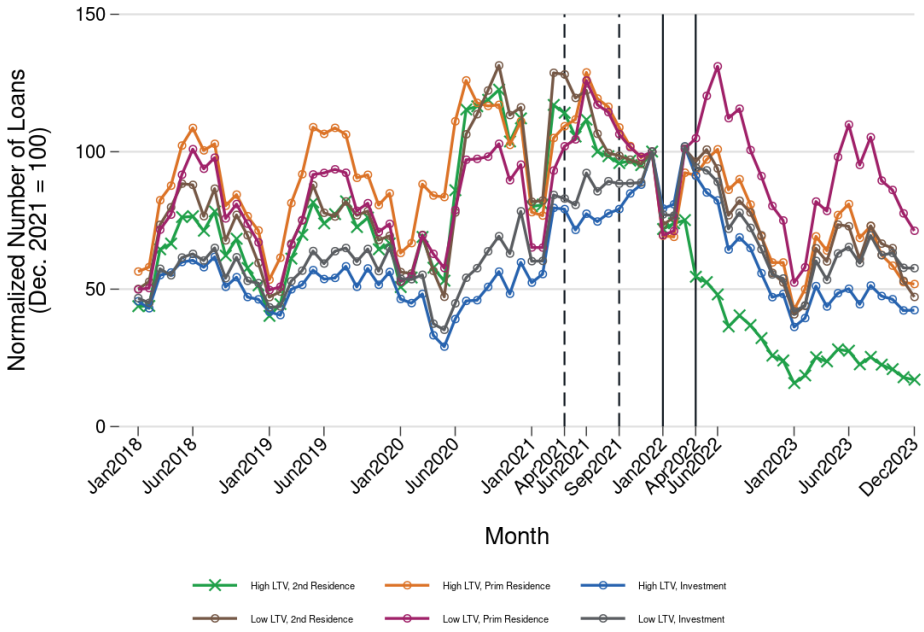
Finally, to measure the combined effect of these changes on the prices being paid by second residence borrowers, Figure 8 shows the average rate spread on all conventional purchase mortgages for second residence loans, primary residence loans, and loans for investment properties. As expected, the effect of the fee increase on conventional loans overall appears muted relative to the effect on GSE loans alone, as shown in Figure 5, but still can be observed as an increase in rate spreads from roughly 0.35 to 0.65 between the policy announcement and implementation.

Figure 6: Share of Conventional Second Residence Purchase Loans Guaranteed by GSEs



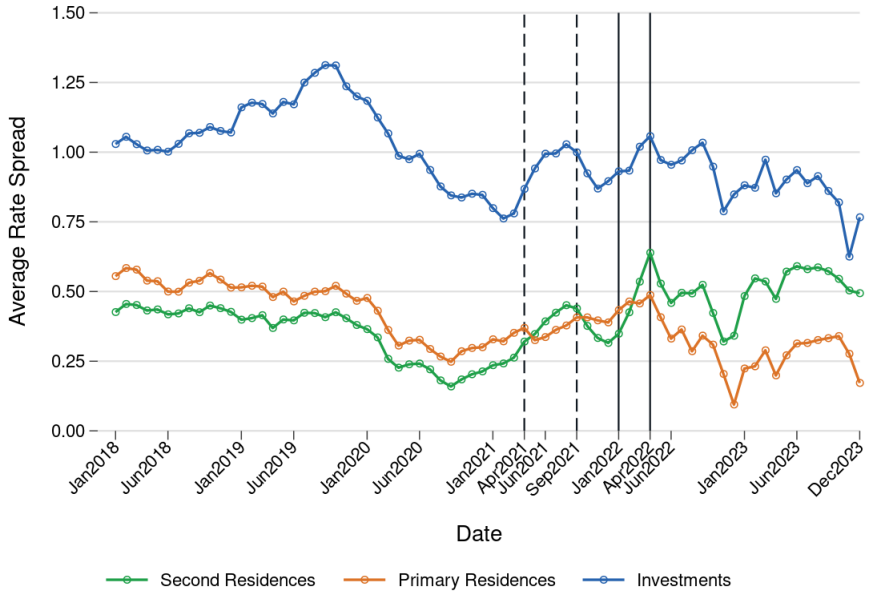
Note: 2018-2023, conventional purchase originations, secondary residence occupancy type, confidential HMDA data. Originations from November and December of each year are excluded as those loans may not have had time to be purchased by the GSEs prior to annual HMDA reporting deadlines. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. Dashed vertical lines indicate the start and end dates of the GSE purchase cap policy affecting both second residence and investment property mortgages (Amornsiripanitch et al., 2025).

Figure 7: Normalized Count of High-LTV Second Residence Loans Versus Other Loan Types



Note: 2018-2023 confidential HMDA data. High-LTV loans are defined as having LTVs ≥ 75. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. Dashed vertical lines indicate the start and end dates of the GSE purchase cap policy affecting both second residence and investment property mortgages (Amornsiripanitch et al., 2025). After the implementation date of the fee increase, the normalized count of high-LTV second residence loans falls below the trend for other loan types.

Figure 8: Average Rate Spread on Conventional Purchase Mortgages, by Occupancy Type



Note: 2018-2023 confidential HMDA data, conventional purchase mortgages. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. Dashed vertical lines indicate the start and end dates of the GSE purchase cap policy affecting both second residence and investment property mortgages (Amornsiripanitch et al., 2025).

Collectively, this evidence suggests that while lenders and consumers may have been able to somewhat lessen the effects of the fee increase through substitution to non-GSE loans or other loan types, the fee increase meaningfully reduced credit for second residence lending overall. In the next section, we quantify these effects with our empirical model, and explore potential spillover effects on the local housing markets most affected by the policy change.

4 Empirical Model

To quantify the causal effects of the increased fees on second residence mortgages, we estimate a series of generalized difference-in-difference and synthetic difference-in-difference models with a binary treatment indicator.[10] In all models, the key identifying assumption is that the outcome of interest—the price or number of second residence loan originations, for example—would have followed the same time trend as the control group after the treatment date (April 2022) absent the policy change. For outcomes where a control group with parallel trends is directly available, a difference-in-differences model is used. Where such a control group is not immediately identifiable in the data, we use synthetic difference-in-differences methods to essentially construct a control group in a data-driven manner Arkhangelsky et al. (2021). The exact model specifications are

[10] Alternative specifications with continuous treatment definitions—such as the size of the fee increase or the share of second residence loans among all mortgages in a county—would require stronger assumptions about parallel trends that may not be plausible for the outcomes studied (Callaway, Goodman-Bacon and Sant'Anna, 2024).

described below.

To estimate the effects of the policy change on prices for second residence loans, we estimate a loan-level differences-in-differences (two-way fixed effects) model, motivated by the similar pre-policy trends in interest rate spreads for second residence loans as compared to primary residence and investment loans as seen in Figures 5 and 8. The estimating equation is

$$r_i = \beta_1 \text{Post}_t 2\text{ndRes}_i + \beta_2 2\text{ndRes}_i + \beta_3 \text{GSECap}_{it} + \boldsymbol{\beta X_i} + \theta_t + \theta_j + \theta_s + \epsilon_i \tag{1}$$

where the outcome r_i is the rate spread (APR minus the prime interest rate) for loan i, while β_1 is the treatment effect coefficient on the interaction term of an indicator for the post-treatment time period t and an indicator that loan i is a second residence loan. The non-interacted indicator for second residence status controls for level differences in the price of second residence loans, while the time fixed effects θ_t control for time trends. All specification also include fixed effect controls for state θ_s and lender θ_j. We also estimate specifications with additional vectors of controls, $\boldsymbol{X_i}$, sequentially adding loan characteristics, applicant characteristics, and property characteristics.

To estimate the effect of the policy change on the number of high-LTV second residence loans (defined as our treated group), we use synthetic difference-in-differences models (Arkhangelsky et al., 2021) at the state-loan type level, given that the time trends for other loan types are not necessarily parallel to those for high-LTV loans in the pre-treatment period, as shown in Figure 7. This method is essentially a standard difference-in-differences model, but with the addition of weights, $\hat{w}_g$ and $\hat{w}_t$, at the state-loan type (g) and month (t) level that are estimated to ensure that the comparison is made between treated units and control units which were approximately following parallel trends prior to the policy change (Clarke et al., 2023).

The standard difference-in-differences version of the model would be

$$y_{gt} = \beta \text{Post}_t \text{Treated}_g + \theta_t + \alpha_g + \mu + \epsilon_{gt} \tag{2}$$

where the outcome is the count of loans in a state-loan type group (g) in a particular month, normalized by the count in December 2021 as in Figure 7 to account for size differences between states and loan type groups. Estimation of this standard difference-in-differences model can be rewritten as minimizing the sum of squared error terms ϵ_{gt}

$$\left(\hat{\beta}, \hat{\theta}_t, \hat{\alpha}_g, \hat{\mu}\right) = argmin \left\{ \sum_t \sum_g (y_{gt} - \beta \text{Post}_t \text{Treated}_g - \theta_t - \alpha_g - \mu)^2 \right\}. \tag{3}$$

In this form, the synthetic difference-in-difference model we estimate can then be written as

$$\left(\hat{\beta}, \hat{\theta}_t, \hat{\alpha}_g, \hat{\mu}\right) = argmin \left\{ \sum_t \sum_g (y_{gt} - \beta \text{Post}_t \text{Treated}_g - \theta_t - \alpha_g - \mu)^2 \hat{w}_g \hat{w}_t \right\}. \tag{4}$$

where the group ($\hat{w}_g$) and time ($\hat{w}_t$) weights are flexibly estimated to minimize pre-treatment differences in parallel trends between the treatment and control groups as described in Arkhangelsky

et al. (2021).[11]

Finally, to estimate potential spillover effects of the policy change on lending for primary residence loans, we use the same synthetic difference-in-differences model, but with groups defined at the county level, and treated counties defined as those with a high share of pre-treatment second residence lending.[12] Specifically, counties are assigned to deciles based on the share of 2021 purchase mortgages that were for second residences. Those in the top decile are considered treated, while all other counties serve as controls. Reflecting the high concentration of second residence loans in particular counties, 32% of purchase loans in treated counties were for second residences in 2021, compared to 4% in control counties.

5 Results

The models described in Section 4 are used to quantify the effects of increased second residence guarantee fees on the prices of second residence loans, the number of second residence loans originated, and the effects on overall lending in areas with many second residences, including potential spillover or substitution effects on borrowers seeking primary residence loans or investment loans.

5.1 Effect of policy change on second residence loan prices

Table 2 presents results from the estimation of equation (1) on conventional purchase originations from 2018 through 2023, where the outcome variable is the loan-level rate spread. The average treatment effects, shown in the first row, are the estimated effect on second residence loans originated after the policy implementation date of April 1st, 2022. Specifications 1 to 4 include an increasingly comprehensive set of loan, applicant, and property level control variables. The estimated treatment effect is stable across specifications, with an estimated price increase of 0.35 percentage points when including the full set of controls. This reflects the average price increase across both GSE and non-GSE mortgages, and reflects a substantially higher cost of credit for second residence borrowers. For an average second residence loan amount of $359,000, this equals $1,260 *per year* in additional costs. Notably, the costs are even higher when restricting the sample to only GSE mortgages. Table 3 shows that, among GSE loans only, the fee increase raised rate spreads by 0.52 basis points when including all controls. This equates to $1,867 *per year* in additional costs on a $359,000 loan.

Having established a substantial increase in the cost of credit for second residences, we next assess how the policy change affected second residence lending volumes.

[11] The models are estimated in Stata using the "sdid" command, as described in Clarke et al. (2023).

[12] For this specification, we define groups at the county level to approximate local real estate markets within which changes in demand from one group of prospective buyers could affect the likelihood of purchases by other buyers.

Table 2: Difference-in-Difference Regression Model of Rate Spread, Conventional Loans

	(1) Rate Spread	(2) Rate Spread	(3) Rate Spread	(4) Rate Spread
(2nd Res. Loans) x (After Apr. 2022)	0.3551***	0.3644***	0.3469***	0.3478***
	(0.0286)	(0.0313)	(0.0299)	(0.0298)
2nd Res. Loans	-0.0933***	-0.1631***	-0.1626***	-0.1641***
	(0.0077)	(0.0310)	(0.0282)	(0.0285)
GSE Cap Timeframe	-0.1626***	-0.0832***	-0.0735***	-0.0767***
	(0.0126)	(0.0106)	(0.0103)	(0.0104)
Loan Characteristics	No	Yes	Yes	Yes
Applicant Characteristics	No	No	Yes	Yes
Property Characteristics	No	No	No	Yes
Time FEs	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes
State FEs	Yes	Yes	Yes	Yes
R^2	0.3778	0.3662	0.4481	0.4540
adj. R^2	0.3777	0.3660	0.4480	0.4538
N	22,747,164	21,902,632	20,045,493	20,045,493

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: 2018-2023 confidential HMDA data, first-lien conventional purchase loans. Dependent variable is the winsorized rate spread variable. Unit of observation is the loan level.

Table 3: Difference-in-Difference Regression Model of Rate Spread, GSE Loans

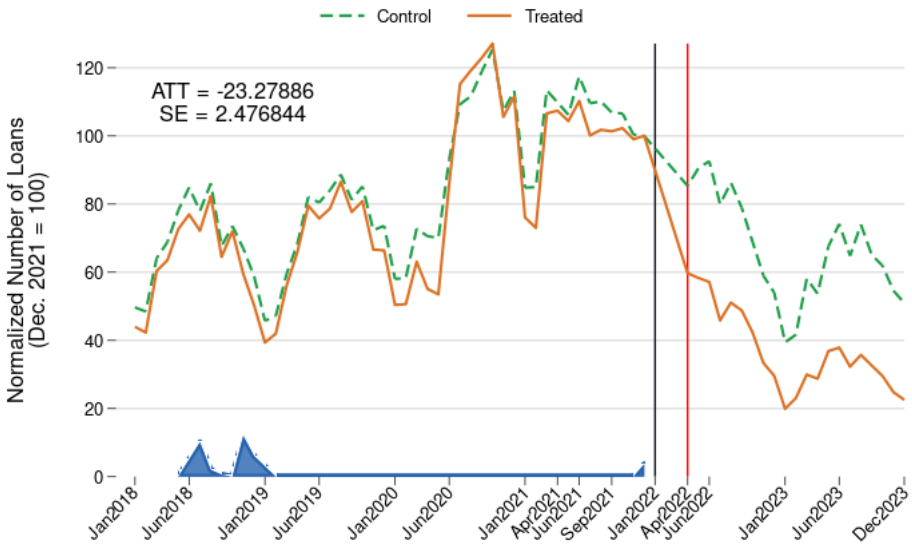
	(1) Rate Spread	(2) Rate Spread	(3) Rate Spread	(4) Rate Spread
(2nd Res. Loans) x (After Apr. 2022)	0.5644***	0.5338***	0.5241***	0.5222***
	(0.0218)	(0.0270)	(0.0275)	(0.0273)
2nd Res. Loans	-0.0277***	-0.1965***	-0.1965***	-0.1988***
	(0.0073)	(0.0477)	(0.0443)	(0.0445)
GSE Cap Timeframe	-0.1913***	-0.1222***	-0.1134***	-0.1155***
	(0.0139)	(0.0142)	(0.0143)	(0.0143)
Loan Characteristics	No	Yes	Yes	Yes
Applicant Characteristics	No	No	Yes	Yes
Property Characteristics	No	No	No	Yes
Time FEs	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes
State FEs	Yes	Yes	Yes	Yes
R^2	0.1636	0.2863	0.3923	0.3958
adj. R^2	0.1634	0.2861	0.3921	0.3956
N	7,707,746	7,682,654	7,039,661	7,039,661

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: 2018-2023 confidential HMDA data, first-lien conventional purchase loans that were purchased by the GSEs. Dependent variable is the winsorized rate spread variable. Unit of observation is the loan level.

Figure 9: Effect of Fee Change on High-LTV Second Residence Lending, Synthetic Difference-in-Differences Model



Note: 2018-2023 confidential HMDA data. High-LTV loans are defined as having LTVs $\geq$ 75. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. Loan counts are normalized to equal 100 in December 2021. The treatment group is High-LTV second residence loans, while all other loan categories serve as controls. The blue shaded areas show the relative weights calculated for pre-treatment time periods, following Clarke et al. (2023). Periods with more similar outcomes to post-treatment periods, among control units, have greater weight.

5.2 Effect of policy change on second residence loan originations

Based on the evidence in Section 3.2, which suggested a decline in second residence lending among loans with higher LTVs, we estimate the synthetic difference-in-differences model in equation 4 using High-LTV (LTV $\geq$ 75) second residence loans as the treated group. Figure 9 shows the pre- and post-policy trends for the treated group relative to other loan types using the modeled time and group weights, where origination counts have been normalized to 100 at their December 2021 level. We estimate an average treatment effect of -23.3, corresponding to a 23 percent decline in originations for High-LTV second residence loans relative to their pre-treatment level.

This reflects the direct effect of the fee increase on the targeted loan types. This shows that borrowers seeking High-LTV second residence mortgages are significantly affected by the availability and pricing of GSE credit, and that such borrowers are not able to fully substitute to other credit options in the market.

While these results rule out the possibility of full, one-to-one substitution from GSE to non-GSE credit for borrowers seeking second residence loans, there remains the possibility that the decline in lending to borrowers seeking High-LTV second residence loans was offset by increased lending to borrowers for other loan types. To assess these effects, we next focus on counties where a substantial share of pre-treatment lending was for second residence loans, and estimate effects

on overall lending and lending for primary residences and investment properties relative to other counties.

5.3 Effects on lending in counties with many second residences

Having established the significant reduction in available credit for second residence purchases due to the fee increase, this section assesses how the reduced supply of credit for second residence purchases has affected local markets, defined here at the county level. The reduction in lending for second residences could have been partially or fully offset by lending to borrowers purchasing homes as primary residences or investment properties, if the properties second residence buyers would have purchased have sufficient demand from such other buyers. As described in section 4, we use synthetic difference-in-differences models to compare monthly lending volumes in counties that were in the top decile for second residence lending in 2021—the treated group—to all other counties. Given the different populations and housing stocks across counties, we normalize lending volumes by the number of housing units in a county in 2018.

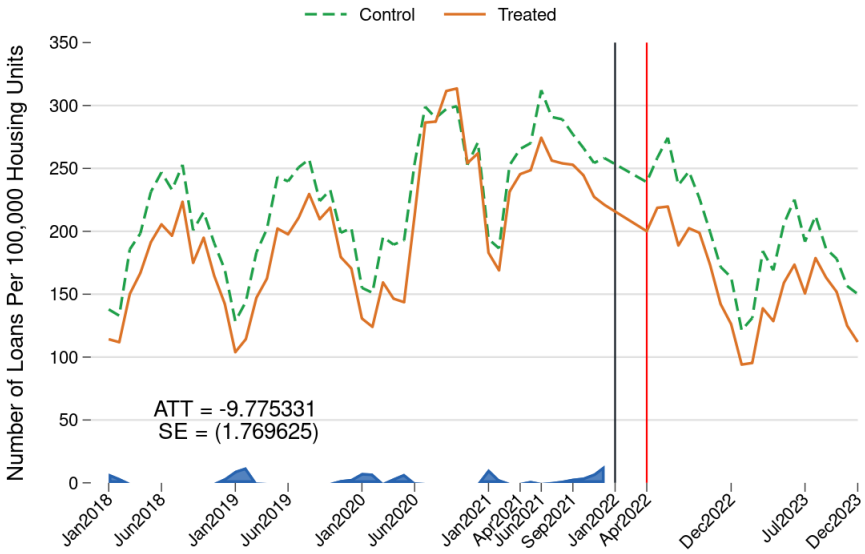
Overall, as shown in Figure 10, we find that lending in counties with many second residences saw a statistically significant average monthly decline of 9.8 loans per 100,000 housing units after the fee increase. This represents a roughly 5 percent decline in overall lending for purchase mortgages, relative to the pre-treatment monthly mean of 200 loans per 100,000 housing units in treated counties. This suggests that the fee increase led to an absolute decline in lending for purchase mortgages in counties with many second residences, meaning that declines in second residence loans were not fully offset by increases in loans for other loan types.

Figure 11 shows the results from the same regression model restricted to only primary residence loans. We find no statistically significant change in primary residence lending, meaning that the pullback in credit for second residence loans does not appear to have led to an increase in primary residence lending, as could have occurred if the fee increase enabled primary residence borrowers to purchase homes that would have gone to second residence buyers absent the fee increase.

We do find statistically significant evidence of an increase in lending for investment purchases, shown in Figure 12, though the smaller magnitude of 1.9 loans per 100,000 housing units suggests that investment purchases may have offset a small share, less than 20 percent, of the decline in second residence loans.

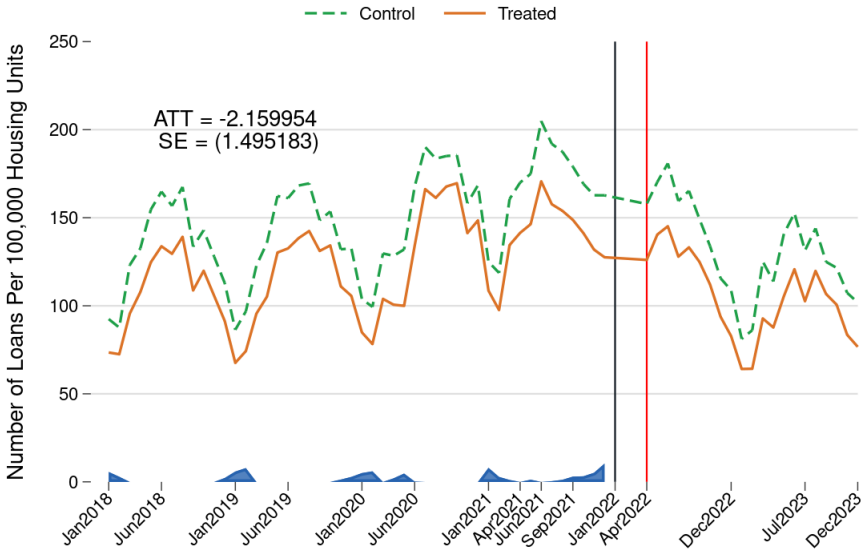
Taken as a whole, these results suggest that the fee increase led to a decline in lending for second residence purchases, which was largely not offset by increased lending for purchases by other borrowers. One potential explanation is that cash purchases by second residence buyers could offset some or all of the decline. This seems unlikely for the High-LTV borrowers who saw the strongest decline in borrowing, as they are likely credit constrained and may not have the resources to make cash purchases. But other less-constrained second residence buyers may be able to take up some of the slack in the market. Another explanation could be that the fee increase led to a decrease in local housing market activity, reducing the total number of home sales. This could occur if home prices are slow to adjust to a decline in demand from second residence buyers,

Figure 10: Synthetic Difference-in-Differences Effect on Overall Purchase Loan Counts, Counties in Top Decile of Second Residence Lending



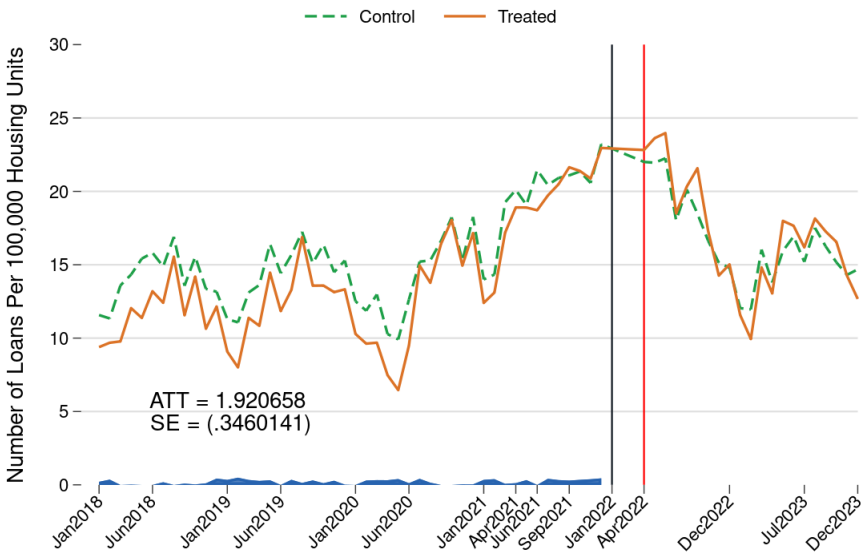
Note: 2018-2023 confidential HMDA data. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. The blue shaded areas show the relative weights calculated for pre-treatment time periods, following Clarke et al. (2023).

Figure 11: Synthetic Difference-in-Differences Effect on Primary Residence Purchase Loan Counts, Counties in Top Decile of Second Residence Lending



Note: 2018-2023 confidential HMDA data. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. The blue shaded areas show the relative weights calculated for pre-treatment time periods, following Clarke et al. (2023).

Figure 12: Synthetic Difference-in-Differences Effect on Investment Purchase Loan Counts, Counties in Top Decile of Second Residence Lending



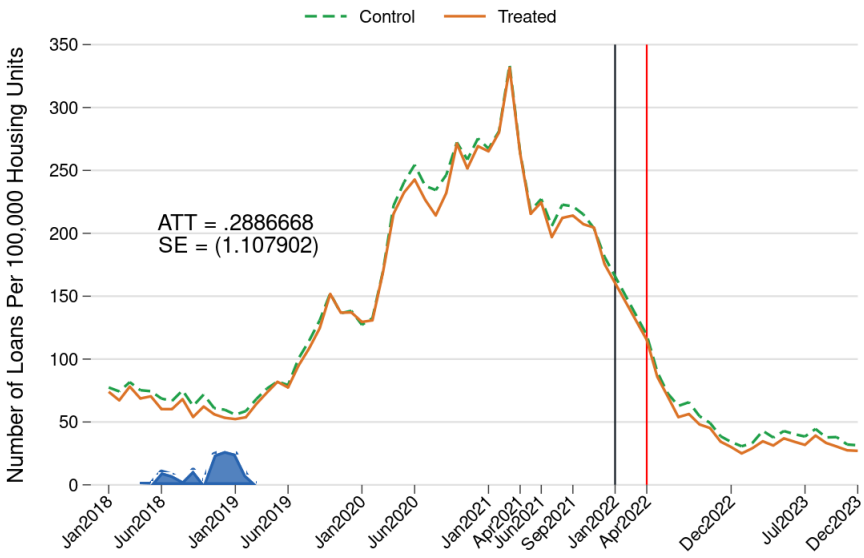
Note: 2018-2023 confidential HMDA data. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. The blue shaded areas show the relative weights calculated for pre-treatment time periods, following Clarke et al. (2023).

or if the current owners of second residences reduce listings of their properties. Further research is needed to distinguish these potential dynamics in markets with many second residences.

6 Robustness

One threat to our identification strategy is that some change in economic conditions that occurred at the same time as the policy change we study could have differentially affected treated counties—those with many second residence mortgages—relative to controls, even after conditioning on comparable trends in the pre-treatment period. The most likely example would be the sharp rise in interest rates that occurred in early 2022, coincident with the policy change. To test the synthetic diff-in-diff model's ability to control for differential trends across counties that are unrelated to the policy change, we conduct two placebo tests. The first test uses refinance loans which, while sensitive to interest rate changes, should be unaffected by the policy change and unaffected by local housing market conditions. The second test uses a placebo definition of treated counties, those with many mortgages for investment properties, which may also be sensitive to interest rates but were not directly affected by the policy change, as documented in Section 3.2.

Figure 13: Placebo Test - Synthetic Difference-in-Differences Effect of Fee Change on Primary Residence Refinance Loan Counts



Note: 2018-2023 confidential HMDA data. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. The blue shaded areas show the relative weights calculated for pre-treatment time periods, following Clarke et al. (2023).

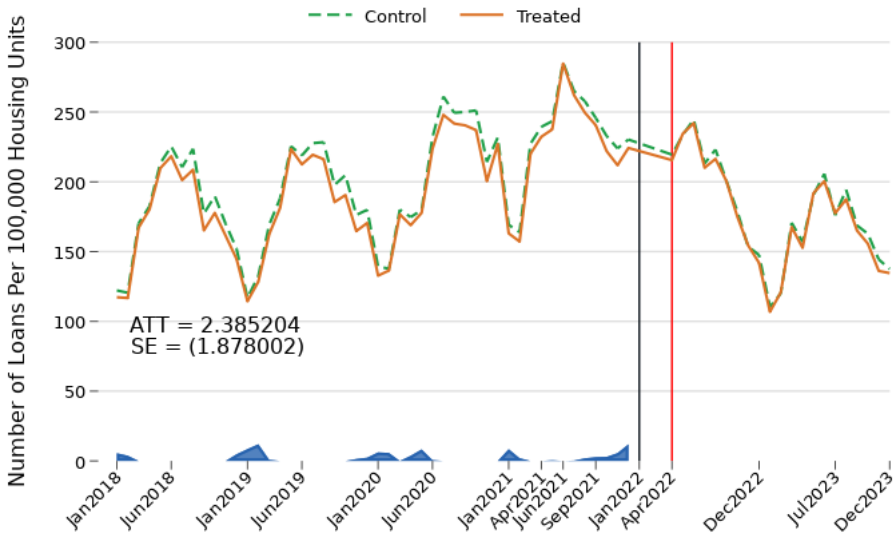
6.1 Placebo test - Primary residence refinance mortgages

The first placebo test uses loan volumes of primary residence *refinance* loans as an outcome, comparing loan volumes in treated counties to loan volumes in control counties. Although primary residence refinances are very sensitive to interest rates, they were not affected by the sharp fee increase we study and—unlike purchase loans—they are generally unaffected by local housing market conditions or potential spillover effects. Figure 13 shows weighted trends and the estimated treatment effect, which is near zero and statistically insignificant. This supports the interpretation of our estimated treatment effects as resulting from the effects of the fee increase on second residence lending specifically, rather than from differential trends in economic conditions or mortgage credit availability, or a differential response to interest rate changes in treated counties relative to controls.

6.2 Placebo test - Counties with many investment property mortgages

The second placebo test looks at overall lending volumes as in Figure 10, but assigns counties in the top decile of *investment* purchase loans as treated, while other counties serve as controls. Like second residences, investment properties are not owner occupied and may be more sensitive to prevailing interest rates. But investment property mortgages were not directly affected by the policy change. If our estimated treatment effects were measuring an effect of rising interest rates on

Figure 14: Placebo Test - Synthetic Difference-in-Differences Effect of Fee Change in Counties with Top Decile of Investment Loans



Note: 2018-2023 confidential HMDA data. Vertical solid lines indicate the announcement and implementation dates of the fee increase on second residence loans. The blue shaded areas show the relative weights calculated for pre-treatment time periods, following Clarke et al. (2023).

non-owner-occupied housing, we may expect to see a similar decline in lending in markets with high shares of investment properties. The results, shown in Figure 14, show no statistically significant effect on overall lending in counties with many investment loans, relative to all other counties, at the time of the fee increase. This supports our interpretation that our main estimates are measuring the effect of the second residence fee increase, rather than changes in interest rates or economic conditions affecting non-owner-occupied housing.

7 Conclusion

This paper documents unique features of the second residence mortgage market, and explores how policies affecting such mortgages fit into larger discussions related to housing availability and affordability. We document that second residence mortgages are very concentrated in certain counties, and thus could play an important role in these local markets. We find that a policy change that increased prices for second residence mortgages substantially reduced lending for high-LTV second residence loans, leading to an overall decline in lending in markets with many second residences. We do not find evidence of increased lending for primary residence homebuyers, and very limited offsetting increases in lending for investment properties.

The lack of measurable effects for primary residence lending may be due to the particular dynamics of local markets with many second residences, the prevalence of competing cash buyers,

or the characteristics of properties that are typically purchased as second residences. More research is needed to understand buyer and seller behavior in housing markets with large numbers of second resident owners and potential second resident buyers. Understanding these dynamics could inform the design and expected effects of policies that aim to influence access to credit and homeownership.

References

Agarwal, Sumit, Cristian Badarinza, and Wenlan Qian (2018) "The effectiveness of housing collateral tightening policy," *Available at SSRN*, DOI: http://dx.doi.org/10.2139/ssrn.2917308.

Agarwal, Sumit, Kwong Wing Chau, Maggie Hu, and Wayne Xinwei Wan (2022) "Tobin tax policy, housing speculation, and property market dynamics," *Available at SSRN*, DOI: http://dx.doi.org/10.2139/ssrn.3641624.

Alexandrov, Alexei, Thomas S Conkling, and Sergei Koulayev (2024) "Changing the scope of GSE loan guarantees: estimating effects on mortgage pricing and availability," *The Journal of Real Estate Finance and Economics*, Vol. 69, pp. 409–451.

Allen, Marcus T, Jessica Rutherford, Ronald Rutherford, and Abdullah Yavas (2018) "Impact of investors in distressed housing markets," *The Journal of Real Estate Finance and Economics*, Vol. 56, pp. 622–652.

Amornsiripanitch, Natee and Judith Ricks (2024) "Lenders' Response to Mortgage Guarantee Fees," *Available at SSRN*, DOI: http://dx.doi.org/10.2139/ssrn.5049729.

Amornsiripanitch, Natee, Philip E Strahan, Song Zhang, and Xiang Zheng (2025) "GSE Restrictions, Credit Supply, and Rental Market Spillovers," *Available at SSRN*, DOI: http://dx.doi.org/10.2139/ssrn.4573954.

Anderson, Nathan B (2004) "Property taxation without representation: Vacation homes and local revenue," in *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, Vol. 97, pp. 202–208, JSTOR.

——— (2006) "Beggar thy neighbor? Property taxation of vacation homes," *National Tax Journal*, Vol. 59, pp. 757–780.

Anenberg, Elliot and Daniel Ringo (2024) "Volatility in Home Sales and Prices: Supply or Demand?" *Journal of Urban Economics*, Vol. 139, p. 103610.

Arkhangelsky, Dmitry, Susan Athey, David A Hirshberg, Guido W Imbens, and Stefan Wager (2021) "Synthetic difference-in-differences," *American Economic Review*, Vol. 111, pp. 4088–4118.

Badarinza, Cristian, Vimal Balasubramaniam, and Tarun Ramadorai (2024) "In Search of the Matching Function in the Housing Market," *Available at SSRN*, DOI: http://dx.doi.org/10.2139/ssrn.4594519.

Badarinza, Cristian and Tarun Ramadorai (2018) "Home away from home? Foreign demand and London house prices," *Journal of Financial Economics*, Vol. 130, pp. 532–555.

Bhutta, Neil and Daniel Ringo (2021) "The effect of interest rates on home buying: Evidence from a shock to mortgage insurance premiums," *Journal of Monetary Economics*, Vol. 118, pp. 195–211, DOI: http://dx.doi.org/10.1016/j.jmoneco.2020.10.001.

Callaway, Brantly, Andrew Goodman-Bacon, and Pedro HC Sant'Anna (2024) "Difference-in-differences with a continuous treatment," Working Paper No. 32117, National Bureau of Economic Research.

Chi, Chun-Che, Cameron LaPoint, and Ming-Jen Lin (2020) "Flip or flop? Tobin taxes in the real estate market," *Available at SSRN*, DOI: http://dx.doi.org/https://dx.doi.org/10.2139/ssrn.3761226.

Clarke, Damian, Daniel Pailañir, Susan Athey, and Guido Imbens (2023) "On synthetic difference-in-differences and related estimation methods in Stata," *Stata Journal*.

Cvijanović, Dragana and Christophe Spaenjers (2021) ""We'll always have Paris": Out-of-country buyers in the housing market," *Management Science*, Vol. 67, pp. 4120–4138.

Elul, Ronel, Aaron Payne, and Sebastian Tilson (2023) "Owner-occupancy fraud and mortgage performance," *Real Estate Economics*, Vol. 51, pp. 1137–1177, DOI: http://dx.doi.org/10.1111/1540-6229.12455.

Favilukis, Jack and Stijn Van Nieuwerburgh (2021) "Out-of-Town Home Buyers and City Welfare," *The Journal of Finance*, Vol. 76, pp. 2577–2638, DOI: http://dx.doi.org/10.1111/jofi.13057.

Fu, Yuming, Wenlan Qian, and Bernard Yeung (2016) "Speculative investors and transactions tax: Evidence from the housing market," *Management Science*, Vol. 62, pp. 3254–3270.

Garriga, Carlos, Pedro Gete, and Athena Tsouderou (2023) "The economic effects of real estate investors," *Real Estate Economics*, Vol. 51, pp. 655–685.

Gete, Pedro and Franco Zecchetto (2018) "Distributional implications of government guarantees in mortgage markets," *The Review of Financial Studies*, Vol. 31, pp. 1064–1097.

Goodman, Laurie, Jim Parrott, Bob Ryan, and Mark Zandi (2022) "How Fannie and Freddie Can Use Pricing to Expand Affordable Homeownership," URL: https://www.urban.org/research/publication/how-fannie-and-freddie-can-use-pricing-expand-affordable-homeownership.

Gorback, Caitlin S and Benjamin J Keys (2020) "Global capital and local assets: House prices, quantities, and elasticities," Working Paper No. 27370, National Bureau of Economic Research.

Han, Lu and William C Strange (2015) "The microstructure of housing markets: Search, bargaining, and brokerage," *Handbook of regional and urban economics*, Vol. 5, pp. 813–886.

Hogan, Joseph Patrick (2016) *An empirical analysis of government-sponsored enterprise policy*: Columbia University.

Ihlanfeldt, Keith and Cynthia Fan Yang (2023) "Are the home values and property tax burdens of permanent homeowners affected by growth in housing rentals and second homes: Evidence based on big data from Florida," *Journal of Regional Science*, Vol. 63, pp. 470–502.

Lambie-Hanson, Lauren, Wenli Li, and Michael Slonkosky (2022) "Real estate investors and the US housing recovery," *Real Estate Economics*, Vol. 50, pp. 1425–1461.

Li, Zhimin, Leslie Sheng Shen, and Calvin Zhang (2024) "Local effects of global capital flows: A China shock in the US housing market," *The Review of Financial Studies*, Vol. 37, pp. 761–801.

Liu, Feng, Jason Dietrich, Young Jo, Akaki Skhirtladze, Misha Davies, and Corinne Candilis (2019) "Introducing new and revised data points in HMDA," *CFPB Office of Research Reports Series No. 19-5*, DOI: http://dx.doi.org/10.2139/ssrn.3786949.

Liu, Liyi, Doug McManus, and Elias Yannopoulos (2022) "Geographic and temporal variation in housing filtering rates," *Regional Science and Urban Economics*, Vol. 93, p. 103758, DOI: http://dx.doi.org/10.1016/j.regsciurbeco.2021.103758.

Mills, James, Raven Molloy, and Rebecca Zarutskie (2019) "Large-scale buy-to-rent investors in the single-family housing market: The emergence of a new asset class," *Real Estate Economics*, Vol. 47, pp. 399–430.

Ngai, L Rachel and Kevin D Sheedy (2024) "The Ins and Outs of Selling Houses: Understanding Housing-Market Volatility," *International Economic Review*.

Rosenthal, Stuart S. (2014) "Are Private Markets and Filtering a Viable Source of Low-Income Housing? Estimates from a "Repeat Income" Model," *The American Economic Review*, Vol. 104, pp. 687–706, URL: http://www.jstor.org/stable/42920713.

Sá, Filipa (2024) "The effect of foreign investors on local housing markets: Evidence from the UK," *Journal of Economic Geography*, DOI: http://dx.doi.org/10.1093/jeg/lbae043.

Sweeney, James L. (1974) "A commodity hierarchy model of the rental housing market," *Journal of Urban Economics*, Vol. 1, pp. 288–323, DOI: http://dx.doi.org/10.1016/0094-1190(74)90010-2.