Does Local Competition Matter for Mortgage Pricing? Evidence from Fee Pass-Through

Abstract

This paper examines how market structure shapes the pass-through of secondary-market funding costs to mortgage borrowers. We exploit the Federal Housing Finance Agency's unexpected announcement of the Adverse Market Refinance Fee in August 2020, which imposed a 50 basis point surcharge on conforming refinance loans sold to the GSEs. Using high-frequency mortgage rate-lock data and a difference-in-differences design, we find that lenders fully passed the fee through to borrowers, with 58 percent reflected in higher interest rates and 46 percent in upfront charges via discount points. Pass-through is uniform across counties regardless of local market concentration, indicating that geographic competition plays little role in shaping pass-through. In contrast, we document systematic heterogeneity by lender size—large lenders consistently exhibit full pass-through, while smaller lenders transmit significantly less, even after conditioning on time-varying local economic conditions. These findings suggest that the incidence of funding cost shocks is not mediated by local competition but instead reflects systematic differences across lender size.

1 Introduction

Mortgage markets are central for household borrowing and for the transmission of both monetary policy and macroeconomic conditions to the real economy. The nature and the intensity of competition between lenders in this market is a natural concern of policy-makers given the size of mortgage debt in the economy. In this context, a key question is whether frictions in this market—particularly the degree of local competition—shape the extent to which secondary-market or other lender-level funding costs are passed through to households and, in turn, affect household balance sheets. Existing evidence from deposits suggests that local concentration plays an important role in the pass-through of monetary policy to rates on banks' core liabilities (Drechsler et al., 2017), but less is known about the asset side.

Identifying the causal pass-through of funding costs to interest rates and fees faced by borrowers is empirically challenging for several reasons. First, changes in funding costs may be correlated with shifts in borrower composition, as costs tend to rise when riskier borrowers enter the market. Second, the lag between shocks to funding costs and the implementation of price changes provides both borrowers and lenders opportunities to strategically adjust the timing of originations. Third, borrowers can self-select into lower-cost loans by altering loan size or payment terms, confounding estimates of pass-through. Finally, data constraints complicate measurement of the immediate effects of cost shocks, given the delay between loan application and closing.

To address these empirical challenges, we use a high-frequency dataset of mortgage rate locks and a quasi-experimental research design. Specifically, we implement a difference-in-differences strategy that exploits a change in the fee structure for conforming loans in the secondary market. On August 12, 2020, the Federal Housing Finance Agency (FHFA) announced the Adverse Market Refinance (AMR) fee, which imposed an additional 0.5 percent charge on the size of refinance loans purchased by Fannie Mae and Freddie Mac. This surcharge effectively doubled the average fee lenders faced in 2019. Crucially for our design, the AMR fee applied only to conforming refinance loans, which allows us to use purchase loans made in the same location on the same day and with similar characteristics as a control. The announcement represented an unexpected shock to the mortgage market, drawing immediate concern from industry participants and regulators who noted its inconsistency with the broader policy stance of other federal agencies at the time[1].

A key strength of our analysis is the use of Optimal Blue rate lock data, which captures loan terms at the time borrowers lock their interest rate rather than at origination. This

[1]Ramirez, Kelsey. "Housing industry turns against Fannie, Freddie's added refinance fee." *Housing Wire*, 8/14/2020.

feature allows us to observe the market's immediate pricing response to the AMR fee. Unlike conventional datasets, which are reported only at the monthly frequency and reflect loans at closing, Optimal Blue provides exact timestamps at the minute-level for each rate lock. This granularity eliminates biases that arise from the lag between locking and origination and enables us to cleanly identify how cost shocks are transmitted to borrowers.

Leveraging loan-level data with precise (minute-level) time stamps and our empirical design, we find that when loan supply costs increase, lenders fully pass these costs on to borrowers. In the two weeks following the FHFA announcement, interest rates on refinance loans rose by 8.8 basis points relative to purchase mortgages, corresponding to a 3 percent increase relative to pre-announcement averages. The adjustment was immediate, with the effect materializing on the very first day after the announcement.

We further show that upstream loan supply costs also passed through to loan pricing via discount points, namely 0.23 higher discount points after the announcement. Borrowers seeking lower rates can purchase "points," defined as a percentage of the loan balance, which reduce the interest rate according to the prevailing secondary-market pricing. Using Bloomberg MBS quotes, we estimate that one percentage point change in the note rate is worth approximately 3.3 price points. Based on this estimate, our results indicate that roughly 58 percent of the AMR fee was passed through via higher rates and an additional 46 percent via discount points, implying full pass-through of the policy-induced cost increase. The higher price of mortgages is reflected in fewer refinancings relative to purchases immediately after the change. We estimate that there were 5 percentage points fewer refinancings, without changes along the intensive margin (i.e., average loan amount is unchanged).

The full pass-through of the AMR fee to households naturally raises the question of whether local market structure influences the extent to which lenders pass upstream loan supply costs. One possibility is that lenders in concentrated markets exercise market power differently than those in competitive markets, producing heterogeneity in pass-through across geographies. This would mirror the evidence on the deposit side and the pass-through of monetary policy (Drechsler et al. (2017)).

We find that local market structure is not associated with the degree of pass-through, but lender size is. Using pre-period lending volume concentration to classify counties, we find no evidence of such variation. Loan pricing responses are statistically indistinguishable across concentrated and competitive markets across a variety of measures of local concentration (lending-based Herfindahl–Hirschman index, the market share of the largest local or national banks), suggesting that local competition plays little role in shaping the incidence of cost shocks. In contrast, we uncover systematic heterogeneity across lender size. Large lenders (defined as those in the top 10% in the previous month based on total lending volume in

Optimal Blue) consistently pass through the entirety of loan supply cost shocks, while smaller lenders pass through roughly 20 percent less. These results hold even when large and small lenders are compared within the same county and on the same day, ensuring that common local economic conditions cannot explain the differential pass-through across lender size. Furthermore, lender type does not account for the difference. Namely, banks and nonbanks alike exhibit the same size-related heterogeneity.

Finally, we test whether borrower composition accounts for this heterogeneity. When we compare the pass-through within fine bins of credit scores (FICO scores) and cumulative loan-to-value ratios (CLTVs), we do not find that this attenuates the differences between large and small lenders. Pass-through is largely the same for low, middle, and high FICO score and CLTV borrowers. In addition, across all borrower segments, pass-through remains near full for top lenders and consistently lower for smaller lenders. Taken together, these results indicate that the incidence of supply-side cost shocks is uniform across local market structures and borrower types but systematically higher among larger lenders.

Ultimately, our results demonstrate that when loan supply costs increase, mortgage lenders fully transmit these costs to borrowers through higher interest rates and upfront fees. This incidence is remarkably uniform across local market structure, lender type, and borrower characteristics, indicating that the burden of cost shocks is broadly shared across households. The key dimension of heterogeneity arises instead along lender size: large lenders consistently exhibit higher pass-through than smaller lenders. These findings suggest that secondary-market policies targeting funding costs will generate broadly uniform effects on mortgage pricing across geographies, but may differentially affect households depending on whether they borrow from large or small lenders. This highlights the importance for policymakers of considering lender size, in addition to market structure, when assessing the link between credit market interventions, household balance sheets, and financial stability.

Related Literature

This paper contributes to several strands of the literature. First, this paper contributes to the literature exploring the relationship between secondary market prices and primary market outcomes. Since the financial crisis, significant research has found that capacity constraints affect the pass-through of prices between secondary and primary markets for mortgage loans (Fuster et al., 2013, 2021, 2024). Pass-through of funding costs to borrowers occurs through multiple channels beyond interest rates, including origination fees (Liu, 2019; Benetton et al., 2023) and credit rationing (Lim, 2020). When funding costs fall, credit quality may deteriorate due to credit expansion (Tsai, 2023; Ahnert and Kuncl, 2020; Gete and Reher, 2020). Beyond lending markets, a growing literature explores the relationship

between secondary market liquidity and equity issuance (Brugler et al., 2021; Bessembinder et al., 2015; Ellul and Pagano, 2006). This paper extends previous work by studying how an explicit increase in the cost of securitization passes through to primary market financing costs.

This paper is also related to work on the refinancing channel of monetary policy. Prior research has identified several factors that may limit the mortgage refinancing channel of monetary policy. These factors include the average coupon on outstanding mortgages (Berger et al., 2021), home equity (Caplin et al., 1997; Beraja et al., 2018), employment (Defusco and Mondragon, 2020), income (Greenwald, 2018; Agarwal et al., 2021), financial constraints (Agarwal et al., 2013), market structure (Scharfstein and Sunderam, 2017), and fiscal policy (Scharlemann and van Straelen, 2022). We offer novel insight into how variation in pass-through of secondary market fees correlates with competition and market share, jointly.

Indeed, several works have explored the role of market structure in shaping loan prices in mortgage markets. Amel et al. (2018) argue that local market structure fails to correlate with rates, implying mortgage markets are national in scope. Fuster et al. (2024) similarly find that the price of intermediation is uncorrelated with local market structure. Buchak and Jørring (2025) find that higher concentration is related to higher fees, and that it predicts interest rates for loans that have prepayment penalties. Finally, Bhutta et al. (2024) find that concentration matters only for sophisticated borrowers. Importantly, Bhutta et al. (2024) similarly find that larger lenders tend to offer more expensive loans. Our paper departs from previous work by exploiting time variation in cost of funds that applies uniformly to all refinance loans. Doing so, we can study how pre-period measures of concentration and lender size shape changes in loan prices across rates and fees when costs change exogenously, uniformly, and by a large margin. We find that concentration fails to explain variation in rates and fees, whereas lender size serves as the most relevant factor in shaping pass-through.

van Binsbergen and Grotteria (2024) study high-frequency pass-through of funding costs and its interaction with local market concentration, albeit in the context of monetary-policy shocks. While their paper similarly finds full pass-through with no variation across market concentration, they find that pass-through takes four weeks to materialize. In contrast, our results indicate that costs fully pass through immediately through both discount points as well as interest rates. Furthermore, while concentration fails to explain variation in pass-through, there exists significant heterogeneity *within* local markets.

Our setting and data offer several advantages that facilitate these results. First, our setting exploits a shock exclusive to the funding cost of refinance mortgages, as opposed to a monetary policy shock affecting loan demand, bank balance sheets, and the broader macroeconomy. Moreover, our data includes the upfront costs that borrowers pay to bring

down interest rates. The absence of discount points may severely bias estimates of pass-through down, which in our setting represent 40% of overall pass-through. Finally, we study high-frequency changes in mortgage terms at the moment of rate-lock, weeks in advance of mortgage closing. Hence, we are able to measure changes in lending behavior at the moment lenders would most immediately reflect these costs.

Our paper also fits into the literature that measures the pass-through GSE fees to borrowers. Alexandrov et al. (2024) study a September 2015 policy change that decreased one-time, upfront guarantee fees, while Wu and Deng (2024) use annual HMDA data to assess the impact of the 2022 change. Contemporaneous work by Kalda et al. (2025), Amornsiripanitch and Ricks (2025), and Kim et al. (2025) measure the effects of the 2023 change in guarantee fees. Our setting is unique because the fee increase is immediate and unanticipated, such that borrower and lender sorting was not possible. Specifically, the AMR fee shock did not allow borrowers or lenders to adjust the timing of origination, LTV or other characteristics to avoid the increase, unlike previous shocks. Importantly for the study of the role of competition, the extent to which borrowers or lenders select may be itself correlated with market structure. To the best of our knowledge, this paper is the first to combine high-frequency lock (*not* origination) data with an empirical design that accounts for time-variation in credit risk to generate causal estimates of the pass-through of guarantee fees to loan-level rates and fees at a national scale.

2 Institutional Background

This section provides institutional context for the Adverse Market Refinance (AMR) fee introduced by the Federal Housing Finance Agency (FHFA). We begin by outlining the structure of secondary-market fees charged by Fannie Mae and Freddie Mac when lenders sell loans to the government-sponsored enterprises (GSEs). We then describe the introduction of the AMR fee itself and its intended purpose. Finally, we summarize the market's response to the policy and the subsequent reversal of the fee.

2.1 Guarantee Fees

Guarantee fees, or "g-fees," are charges levied by the government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, on lenders that sell mortgages into their portfolios. These fees compensate the GSEs for assuming the credit risk of guaranteeing timely payments of principal and interest to investors in mortgage-backed securities (MBS). In effect, g-fees function as insurance premiums against borrower default on the underlying mortgages.

Guarantee fees consist of two components: an upfront fee collected at the time of loan

sale and an ongoing monthly fee charged over the life of the loan. The level of these fees depends on observable borrower and loan characteristics, including the loan-to-value (LTV) ratio, borrower credit score, property type, loan purpose, and loan term. Following the 2008 financial crisis, Fannie Mae and Freddie Mac lost autonomy over setting guarantee fees after entering conservatorship under the Federal Housing Finance Agency (FHFA). With a mandate to protect taxpayers and promote financial stability, the FHFA introduced a granular, risk-based fee structure, and average guarantee fees more than doubled, reaching roughly 56 basis points by 2019.

2.2 Adverse Market Refinance Fee

During the COVID-19 pandemic, Fannie Mae and Freddie Mac incurred substantial costs from suspending foreclosures and granting repayment forbearance to distressed borrowers. To recoup potential losses associated with these interventions, on August 12, 2020, the Federal Housing Finance Agency (FHFA) announced the introduction of the Adverse Market Refinance (AMR) fee. The policy imposed a 50 basis point fee on the total loan amount at the time that Fannie Mae or Freddie Mac acquired the mortgage. This surcharge represented a near doubling of the average guarantee fee imposed on lenders in 2019.

Key to our analysis, the AMR fee applied exclusively to conforming refinance loans. The fee did not extend to purchase mortgages, loans securitized under Ginnie Mae, or loans retained by lenders in their portfolio. While we were not able to obtain the precise timing of the original announcement, we assume it occurred at 7:30 PM Eastern Standard Time since we know it happened before 8:30 PM but also "after hours" on that day.[2]

The FHFA initially announced that the AMR fee would apply to all loans sold on or after September 1, 2020, leaving lenders only a three-week window between the announcement and the effective date. Prior to origination, borrowers typically obtain a rate lock, which guarantees a specified interest rate for one to two months, giving them the option to close on the loan during that period. Because these rate locks are generally obtained for a period that extends beyond the short 3-week window between the announcement and planned implementation date, and loans require additional time after closing to be delivered to the GSEs, lenders very likely assumed that virtually all refinance loans locked immediately following the announcement would ultimately be subject to the new fee.

[2]Figure A.1 displays the Mortgage Bankers Association's (MBA) response to the initial announcement at 8:30 PM Eastern Standard Time. Since the MBA's response mentions "tonight's announcement", but the MBA also says that the announcement happened "after-hours" in a subsequent August 13 article, we assume a lag of at least one hour between the initial announcement and the subsequent response by the MBA. The August 13, 2020 article is available at https://newslink.mba.org/mba-newslinks/2020/august/mba-newslink-thursday-aug-13-2020/mba-objects-to-gse-adverse-market-refinance-fee/, retrieved September 16, 2025.

This feature makes the AMR fee a uniquely sharp setting for identifying pass-through. Unlike typical changes in funding costs, where expectations form gradually and may be confounded by long lags between policy shifts and loan delivery, the AMR fee immediately altered the cost of all newly locked refinance loans. As a result, lender pricing at the time of lock directly reflects the expectation of incurring the new fee, providing a rare opportunity to cleanly measure how supply-side cost shocks are transmitted to borrowers.

2.3 Market Response and Reversal

Industry leaders widely criticized the AMR fee, arguing that it undermined concurrent efforts by the Federal Reserve to keep mortgage rates low. The Mortgage Bankers Association denounced the policy, noting that "the recent refinance activity has not only helped homeowners lower their monthly payments, but it is also reducing risk to the GSEs and taxpayers."[3] The Community Home Lenders Association echoed these concerns, warning that the policy would harm households at a time when refinancing activity was strengthening balance sheets, and emphasizing that "Congress, the Federal Reserve, and Treasury have been taking strong actions to support our economy."[4] Trade associations representing community banks and credit unions likewise expressed alarm, citing the increased cost of borrowing and the potential erosion of homeowner financial stability.

The announcement also came as a shock to lenders. In a joint statement, a coalition of major industry groups described the FHFA's action as both unexpected and at odds with the policy stance of other federal agencies.[5] Mounting pressure from these groups led the FHFA, on August 25, 2020—two weeks after its initial announcement—to postpone implementation of the AMR fee from September 1 to December 1, 2020, thereby extending the window by three months. In addition, the agency narrowed the scope of the fee, applying it only to refinance mortgages with balances above $125,000. The intensity and immediacy of this reaction underscore that the policy was perceived as a material and unexpected shock to the cost of mortgage credit supply. Because of the reversal on August 25, our tests consider the (roughly) two weeks before the August 12 announcement and the two-week period after that (for a total 26-day window around August 12).

[3] Sorohan, Mike. "MBA Objects to GSE 'Adverse Market Refinance Fee'." *MBA Newslink*, 8/13/2020.

[4] "Industry, White House decry refi fee." *Dodd Frank Update*, 8/14/2020.

[5] Ramirez, Kelsey. "Housing industry turns against Fannie, Freddie's added refinance fee." *Housing Wire*, 8/14/2020.

3 Data

In this section, we describe the data sources used in our analysis. Our primary dataset is Optimal Blue, which provides high-frequency information on mortgage rate locks and loan characteristics. We complement this with loan-level data from the Home Mortgage Disclosure Act (HMDA) to benchmark the representativeness of our sample. In addition, we use Bloomberg MBS quotes to calculate the trade-off between note rates and loan prices.

3.1 Optimal Blue

Optimal Blue is a lending services platform that facilitates mortgage rate locks prior to closing. The company provides software that enables lenders to identify rates for loans based on observable characteristics, determine eligibility, and lock in terms. Loan officers select from offers provided by intermediaries who commit to fund the loan if it closes. The Optimal Blue dataset includes rich borrower and loan characteristics—such as mortgage rate, credit score, debt-to-income ratio (DTI), loan-to-value ratio (LTV), FHA status, loan amount, occupancy type, property type, and county—as well as precise timestamps for when rates are locked. The platform is used by more than 1,000 lenders, including smaller institutions, and accounts for at least one-third of recent mortgage originations.

Lenders in Optimal Blue are anonymized, and a stable identifier is not directly observed. To address this issue, we construct lender identifiers by combining three characteristics: the month and year in which the lender first enters the sample, an indicator for the lender type, and an indicator for the lender's percentile rank in monthly market share.[6] Together, these characteristics provide a quasi-unique identifier that allows us to track institutions consistently across time.[7]

Optimal Blue data offers several advantages relative to alternative datasets commonly used in the literature. First, it is highly granular in both time and geography — Optimal Blue records exact timestamps for each rate lock, which is, to our knowledge, not available in any other mortgage research dataset. This granularity is important for our empirical design. Second, the dataset captures loan terms at the time of the rate lock rather than at origination. This distinction is critical: origination data may fail to immediately reflect policy changes due to the lag between rate lock and loan closing. Such lags can bias estimates downward in a narrow treatment window, or in more complex ways if borrower take-up is

[6]The Optimal Blue data includes indicators for lender type, which appear as mortgage company, bank, credit union, and unclassified. In later tests, our nonbank indicator takes a value of one for mortgage company and zero otherwise.

[7]In unreported tests using 2020 HMDA data and our lender identifier, we find that match propensity varies little over time.

itself endogenous to the policy shock.

3.2 Home Mortgage Disclosure Act

The Home Mortgage Disclosure Act (HMDA) requires virtually all mortgage lenders in the United States to report detailed information on every loan application they receive. Only a small set of institutions are exempt, primarily due to size, location, or loan volume. Reported loan characteristics include loan amount, type, purchaser, lien status, lender identifier, and action taken. Borrower characteristics include income, race, ethnicity, and gender. Property characteristics include property type, occupancy status, state, county, and census tract. To conduct analysis at the lender level, we use a crosswalk maintained by Robert Avery that links subsidiaries to their parent institutions.

3.3 Summary Statistics

Table 1 reports summary statistics for mortgage characteristics in the Optimal Blue sample, focusing on loans rate-locked between January and December of 2019. Using the calendar year prior to the FHFA announcement enables a direct comparison with 2019 HMDA data, providing a benchmark to assess the representativeness of the Optimal Blue sample. To ensure comparability and reduce the influence of outliers, we restrict attention to conforming non-jumbo loans with loan-to-value ratios below 105, loan sizes under $1 million, interest rates below 10 percent, loan terms of 15, 20, or 30 years, and loan prices in the secondary market between 90 and 110, reflecting the amount of points received or paid by the borrower. Because Optimal Blue captures loans intended for sale on the secondary market, we retain only HMDA loans reported as sold after origination.

Under these restrictions, the 2019 Optimal Blue sample includes approximately 1.81 million loans, split between 770,000 refinance loans and 1.04 million purchase loans. Table 1 presents summary statistics separately for the two groups. On average, refinance mortgages exhibit 6 percent larger loan balances, 15 percent lower combined loan-to-value (CLTV) ratios, and 4 percent lower interest rates relative to purchase mortgages. Both loan types display similar secondary-market pricing and are overwhelmingly secured by owner-occupant, single-family properties.

Figure A.2 compares the distributions of key characteristics in Optimal Blue and HMDA. Note that the HMDA sample of sold loans includes approximately 5.37 million loans, of which 2.21 million are refinance loans and 3.16 million are purchase loans. These figures imply that the Optimal Blue sample represents 30 percent of sold loans, with a similar split between refinance and purchase loans. The two datasets align on loan size, interest rates, loan-to-value

ratios, and pricing. Even if the distributions differ on some dimensions (for example, debt-to-income ratios are somewhat lower in Optimal Blue), the support of both distributions does not differ across all variables. Optimal Blue can thus be viewed as a representative sample of the broader universe of sold mortgages on observable characteristics, and it is a reliable data source for studying loan pricing and pass-through at the time of rate lock.

3.4 Bloomberg MBS Quotes

To benchmark the mapping between mortgage rates and secondary-market pricing, we supplement the Optimal Blue data with quotes for the Bloomberg mortgage-backed securities (MBS) index of conventional (i.e., Fannie Mae and Freddie Mac securities) pools of mortgages FNCL 2.0 9/20 MTG and FNCL 2.5 9/20 MTG, where "9/20" refers to the September 2020 cohort of securities and 2.0 and 2.5 are the coupon rates of the securities. These are the two indices made up of securities trading closest to par (those with 2.0% and 2.5% coupons) for the two weeks preceding the announcement. The spread in Column (4) of Table A.1 reflects the price differential associated with a 50 basis point change in the note rate. Doubling this spread yields the implied 100 basis point trade-off, reported in Column (5). Averaging across days over the two weeks before the announcement produces an estimate of roughly 3.3164 price points per one percentage point change in the note rate. We adopt this measure as a benchmark for converting regression estimates expressed in interest rate units into price equivalents.

4 Baseline Results

This section outlines the empirical strategy and reports baseline results from OLS regressions. We estimate that 58 percent of the AMR fee is passed through via higher interest rates on refinance loans, and 46 percent transmitted through upfront discount points. These results are robust to specifications that control for time-varying local economic conditions and lender-specific shocks. Taken together, the evidence indicates that secondary-market costs are fully passed through to borrowers, either through higher rates or higher fees at the time of origination.

4.1 Empirical Design

Estimating the pass-through of secondary-market costs is complicated by several endogeneity concerns. First, changes in these costs are often correlated with shifts in borrower composition. For example, the GSEs may increase fees when they anticipate a higher share of riskier

borrowers. In such cases, higher observed rates could simply reflect borrower risk rather than the actual pass-through of costs. Second, estimates may capture strategic timing by lenders and borrowers who adjust origination behavior around anticipated cost changes. Finally, borrowers may self-select into smaller loans or alter contract terms in ways that reduce their exposure to higher fees, confounding inference.

To address these concerns, we exploit the FHFA's announcement of the Adverse Market Refinance Fee as a plausibly exogenous shock to secondary market costs. Our identification strategy implements a difference-in-differences design, comparing outcomes for conforming refinance mortgages (treated group) with conforming purchase mortgages (control group) before and after the announcement. We estimate versions of the following regression specification using the sample of conforming mortgages (i.e., eligible for sale to Fannie Mae and Freddie Mac):

$$Y_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Refinance_i + \delta Refinance_i \times Post_t + \epsilon_{i,c,t} \tag{1}$$

where $Y_{i,c,t}$ denotes the outcome for loan i in county c at time t. The indicator $Refinance_i$ equals one for refinance loans and zero for purchase loans. The variable $Post_t$ equals one for loans observed after the FHFA's announcement of the AMR fee at 7:30 PM on August 12, 2020. $X_{i,c,t}$ is a vector of loan characteristics, including interest rate, combined loan-to-value (CLTV) ratio, loan size, FICO score, debt-to-income (DTI) ratio, loan price, and indicators for 15-year or 20-year terms, primary residence, and single-family property. Control variables that are perfectly collinear with the dependent variable are excluded. Standard errors are clustered at the county level to account for within-county correlation.

We include county-by-day fixed effects $\alpha_{c,t}$ to capture local economic shocks that vary over time, restricting identification to differential changes across refinance and purchase mortgages originated in the same county on the same day. This ensures that common local shocks—such as changes in employment, house prices, or other county-level conditions—do not confound our estimates. We further include lender-by-day fixed effects $\alpha_{l,t}$ to absorb time-varying heterogeneity at the lender level. These fixed effects account for variation across refinance and purchase loans over very fine time intervals that may reflect lender balance sheet conditions, business models, or size.

Our coefficient of interest, δ, captures the differential change in outcomes for refinance loans relative to purchase mortgages following the AMR fee announcement. Identification relies on the assumption that, absent the policy, refinance and purchase mortgage outcomes would have evolved in parallel within a narrow (two-week) window around the event.

4.2 Identification

The key identifying assumption is that outcomes for refinance mortgages would have evolved in parallel to purchase mortgages in the period following the announcement if not for the AMR fee. Several features of the setting support this assumption. First, the FHFA's decision to impose the AMR fee should be uncorrelated with the identifying variation once common local shocks are controlled for. Although the policy may have reflected heightened macroeconomic uncertainty, such conditions should affect both purchase and refinance loans symmetrically. Moreover, contemporaneous relief policies—including forbearance, foreclosure suspensions, and repayment flexibility—applied equally to purchase and refinance borrowers. Incorporating county-by-time fixed effects thus accounts for any of these local effects that could otherwise bias estimates.

Second, all the narrative evidence points to the announcement being unanticipated by market participants. Borrowers were unlikely to strategically time their refinancing activity around the policy, and industry statements indicate that lenders themselves were surprised by the fee. Thus, neither side of the market adjusted behavior in advance. The timing of the policy also strengthens identification: the AMR fee was announced with only a three-week window before implementation, leaving essentially no time for new rate locks to be originated and closed before loans would be subject to the fee. This unusually narrow window created a discrete break in loan costs that sharply limited anticipatory behavior and generated a clean setting for identification.

Finally, the design of the AMR fee mitigates concerns over endogenous borrower selection. In many contexts, policy changes allow borrowers to alter loan terms—for example, adjusting loan size or LTV ratios—to avoid higher fees, thereby contaminating control groups. In contrast, refinance borrowers facing the AMR fee cannot simply substitute into purchasing a new home instead of refinancing their current mortgage. As a result, the treatment and control groups remain stable across the policy change, preserving comparability. Taken together, these institutional features provide a unique and well-defined shock to funding costs, supporting a credible identification strategy.

Ultimately, the parallel trends assumption cannot be formally tested. Nevertheless, we can assess its plausibility by examining dynamic treatment effects across refinance and purchase mortgages over time. Specifically, we estimate a model that replaces the single interaction term $Refinance_i \times Post_t$ with a full set of refinance-by-period interactions:

$$Y_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Refinance_i + \sum_{s=-N}^{N} \delta_s Refinance_i \times \mathbb{1}_{t=s} + \epsilon_{i,c,t} \qquad (2)$$

Under the identifying assumption, there should be no systematic differences between refinance and purchase mortgages prior to the FHFA announcement, implying that $\delta_s = 0$ for all pre-announcement periods. Evidence of flat pre-trends followed by a sharp break at the time of the announcement would lend support to the parallel trends assumption, indicating that refinance mortgages would not have exhibited differential changes in outcomes absent the AMR fee.

4.3 Effect of FHFA Announcement on Prices

In this subsection, we examine how the FHFA announcement affected loan pricing. We consider two margins of adjustment: interest rates and upfront charges in the form of discount points.

4.3.1 Interest Rates

Table 2 Panel A presents estimates of regression Equation (1) using the mortgage interest rate as the dependent variable. Columns (1) through (5) report estimates using the Optimal Blue sample of conforming loans originated 13 days before and after the FHFA announcement. The estimated coefficients measure the differential change in the mortgage interest rate over time across refinancing status.

In Column (1), absent any fixed effects and controls, we estimate an 8.4 basis point increase in interest rates, statistically different from zero at the 1% level. Relative to an average interest rate of 2.85 for refinance mortgages, this represents a 3% increase in rates. To assess the degree of pass-through, we create a rate–price mapping using Bloomberg MBS quotes from Section 3, where we estimate that a 100 bp change in the note rate corresponds to 3.3164 price points. Under full pass-through, a 50 bp fee implies a 15.1 bp increase in rates. Using this benchmark, the FHFA announcement implies an immediate 56% pass-through to rates.

Column (2) introduces borrower- and loan-level controls, including borrower credit score, loan-to-value ratio, debt-to-income ratio, log loan amount, and discount points, as well as indicators for fixed-rate mortgages, primary occupancy, single-family residences, and loan terms of 15 and 20 years. With these controls, our coefficient of interest estimates the treatment effect by comparing observationally similar refinance and purchase mortgages. In Column (3), we restrict identification to within-county variation. Here, we are effectively comparing changes in interest rates over time across refinance status for loans within the same county. This accounts for slow-moving local economic conditions, unlikely to vary much within a 26-day window. Finally, in Column (4), we account for within-county and

within-time (day) fixed effects jointly, thereby controlling for time-varying local economic conditions affecting the local demand for mortgage credit. Here, we compare interest rates across refinancing status for loans rate-locked on the same day within the same county over the sample period. Across all columns, point estimates vary between 7.3 basis points and 7.7 basis points, in all cases significant at the 1% level.

In Column (5), we jointly control for within-lender and within-time fixed effects, thereby capturing time-varying, lender-specific conditions. This is our most restrictive specification, and it controls for any lender-specific shocks or local mortgage credit conditions. Despite the stringent control, we estimate a treatment effect of 8.8 basis points, statistically significant at the 1% level. Relative to the implied full pass-through of 15.1 basis points, this effect corresponds to approximately 58% pass-through through rates. Taken together, the results indicate lenders increased interest rates following the FHFA announcement, but the pass-through of secondary market costs through rates alone was incomplete. In the next subsection, we examine whether upfront charges in the form of discount points account for the remainder of the pass-through.

4.3.2 Discount Points

When faced with higher interest rates, households can adjust the cost of borrowing by purchasing discount points, an up-front payment equal to one percent of the loan balance. In Section 3, we convert rates to points using an empirical mapping from MBS prices. While borrowers planning to hold a mortgage for its full term benefit most from buying points, financially constrained borrowers or those expecting to prepay early are less likely to do so. Prior work documents that many borrowers purchase points sub-optimally, often due to limited financial sophistication (Agarwal et al., 2017).

In the context of the FHFA announcement, borrowers facing higher interest rates may have chosen to offset the increase in rates by purchasing more discount points. If this adjustment margin is operative, then interest rates alone understate the true degree of pass-through. To test this, we estimate Equation (1) using the number of discount points as the dependent variable.[8]

Table 2 Panel B reports the results. In Column (1), absent controls or fixed effects, we estimate that discount points on refinance mortgages increased by roughly 20 basis points relative to purchase loans, significant at the 1% level. Columns (2) through (4) sequentially introduce borrower- and loan-level controls, county fixed effects, and county-by-day fixed

[8]In the Optimal Blue dataset, the variable loan price measures 100 at par value prior to the purchase of any points. If the borrower purchases one point, the price falls to 99, consistent with the one-to-one mapping between price and points.

effects. Across these specifications, the estimated increase in discount points remains between 19.5 and 20.2 basis points, consistently significant at the 1% level, suggesting that the result is not driven by borrower composition or local economic shocks. Finally, Column (5) introduces lender-day fixed effects, comparing refinance and purchase loans locked on the same day by the same lender. Even under this most restrictive specification, the estimate rises slightly to 22.9 basis points and remains significant at the 1% level.

Given the mapping between interest rates and discount points discussed in Section 3, a 22.9 basis point increase in points corresponds to borrowers paying down roughly 6.9 basis points in interest. Combining the rate and point responses implies total pass-through of approximately 104 percent of the AMR fee, split 58 percent via higher interest rates and about 46 percent via higher upfront costs.[9] Thus, when accounting for both margins of adjustment, the evidence points to complete pass-through of the secondary-market cost shock.

4.3.3 Assessing Pre-Trends

Figure 1 plots estimates of the regression Equation (2) using 95% confidence intervals. The estimates represent differential trends in outcomes across refinancing status for conforming loans around the time of the FHFA announcement. Panel A reports results using mortgage interest rates as the outcome, while Panel B reports results using discount points. Estimates are normalized to the day immediately preceding the announcement, and we plot a 26-day window centered on this baseline. To account for irregularities in mortgage activity over weekends, we measure event time in business days, combining Friday with Saturday and Sunday with Monday. This adjustment smooths weekend volatility in rate-lock volumes and pricing. The specification corresponds to Column (5) of Table 2, which includes county-day and lender-day fixed effects.

Under the key identifying assumption that outcomes for refinance loans would have evolved in parallel to purchase mortgages if not for the FHFA announcement, there should be no significant difference between the two loan types across the pre-period. Indeed, Figure 1 provides direct evidence on this assumption. In the pre-announcement period, the estimates for both interest rates (Panel A) and discount points (Panel B) are small and statistically indistinguishable from zero, indicating that refinance and purchase mortgages followed similar trends prior to the policy shock. At the time of the announcement, however, we observe a sharp and discrete break—refinance loans exhibit an immediate increase of roughly 8 basis

[9]Because rates and points are highly collinear, an alternative specification that jointly estimates their combined change yields a pass-through of 95.64 percent. Between this estimate and that of the separately estimated pass-through, we conclude that pass-through is effectively complete.

points in interest rates relative to purchase loans. In addition, refinance loans experienced a sharp increase in discount points, indicating that borrowers increasingly purchased discount points to further reduce their interest rate. Taken together, the lack of pre-treatment differences and the sharp post-announcement break lend credibility to the parallel trends assumption underlying our design.

4.4 Effect of the FHFA Announcement on Quantities

In this subsection, we explore the quantity response to the AMR Fee announcement. In particular, we study the degree to which loan size (the intensive margin) and refinancing activity (relative to purchase loans, the extensive margin) change following the announcement.

Table 3 Panel A presents estimates of regression Equation (1) using the log of loan amount as the dependent variable. The estimated coefficient measures the change in log of loan size across refinance status following the FHFA announcement. Key to interpreting this result, we will include interest rate and loan price as control variables, so we measure the change in quantities after accounting for what we would expect given the change in prices. While lenders increase the overall cost of borrowing following the AMR fee, borrowers may choose how to distribute this cost across various terms of the mortgage contract, including loan size. In Panel A of Table 3, by controlling for interest rate and loan price, we assess how borrowers choose to reduce their loan size in order to further reduce the pass-through of the AMR fee to the overall cost of borrowing.

In Column (1), absent controls and fixed effects, refinance loan amounts decrease by 2.8% relative to purchase loans after the implementation of the AMR, significant at the 1% level. However, this result fails to differentiate between borrowers opting for smaller loan sizes due to higher costs or, alternatively, less risky borrowers simply exiting the refinance market at the extensive margin. Indeed, the estimated treatment effect is statistically insignificant and economically small after adding borrower- and loan-level controls. Introducing county fixed effects in Column (3) continues to produce no statistically significant estimates. Columns (4) and (5) include county-day and lender-day fixed effects, respectively, yielding negligible, statistically insignificant effects. The point estimate in Column (5), in particular, is precisely zero. Taken together, we find that the effect on loan size is economically and statistically indistinguishable from zero. These estimates imply that there is no change in the tradeoff between loan balances and loan costs relative to the pre-period.

In Column (6), we present estimates after excluding discount points and interest rates as controls. This specification estimates the change in loan balances conditional on borrower-level, county-day, and lender-day factors alone, and thus captures how borrowers trade off higher costs against smaller loan balances. We find that indeed borrowers reduce loan bal-

ances by 2.1 log points, statistically significant at the 1% level. While several previous papers find weaker elasticities when relying on particular subpopulations (for example, borrowers near the conforming loan limit (DeFusco and Paciorek, 2017) or FHA-eligible borrowers (Bhutta and Ringo, 2021)), the larger elasticity here may reflect both the wider distribution of conforming loans on which it is estimated and the elasticity specific to refinance loans alone (Bhutta and Keys, 2016).

To examine the extensive margin, we exploit the fact that the AMR fee applied only to conforming loans, leaving non-conforming loans unaffected. This distinction allows us to construct a new difference-in-differences design in which conforming loans serve as the treated group and non-conforming loans as the control, and we estimate the change in the probability that a loan is a refinancing loan in each group (i.e., we use a zero for purchase loans and a one for refinancings). Our identifying assumption is that, absent the AMR fee announcement, the relative variation in refinance share between conforming and non-conforming mortgage segments remains stable. Under this assumption, common shocks to both loan types are differenced out, isolating the quasi-experimental variation induced by the policy. To implement this design, we estimate the following OLS regression of refinance propensity:

$$Refinance_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Conforming_i + \delta Conforming_i \times Post_t + \epsilon_{it} \quad (3)$$

where $Refinance_{i,c,t}$ equals one if loan i in county c at time t is a refinance loan and zero otherwise. $Conforming_i$ is an indicator variable set to one for conforming loans. The coefficient of interest, δ, captures the differential effect of the FHFA announcement on refinancing shares across conforming and non-conforming mortgage segments. In other words, we are comparing the refinancing likelihood over time of two loans, conforming and non-conforming, originated within the same county and day, accounting for common lender-day conditions.

The underlying assumption is that refinancing propensity would have evolved in parallel absent the FHFA announcement. We will assess the credibility of this assumption by estimating changes in refinancing propensity over time. To do so, we estimate specifications of the following form:

$$Refinance_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Conforming_i + \sum_{s=-N}^{N} \delta_s Conforming_i \times \mathbb{1}_{t=s} + \epsilon_{i,c,t} \quad (4)$$

Table 3 Panel B reports estimates of Equation (3), where the outcome is an indicator variable for refinance status. In Column (1), absent borrower controls or fixed effects, we estimate a 6.9 percentage point decline in refinancing shares following the FHFA announcement,

statistically significant at the 1% level. This estimate could reflect reductions in refinancing activity or differential borrower selection effects across conforming and non-conforming loans. However, this effect remains robust after including borrower- and loan-level controls, attenuating slightly to 4.70 percentage points, still significant at the 1% level. Column (3) adds county fixed effects, producing nearly identical estimates, consistent with robustness to time-invariant local economic conditions. Columns (4) and (5) incorporate county-day and lender-day fixed effects, respectively, further tightening the identification by absorbing time-varying local economic shocks and lender-specific shocks. Even under this most restrictive specification, Column (5) shows a 5.5 percentage point decline in refinancing shares, statistically significant at the 1% level.

Ultimately, the estimates in Table 3 Panel B provide strong evidence that the FHFA announcement caused a significant reduction in refinancing activity. This decline cannot be explained by shifts in borrower composition, local demand conditions, or lender-specific shocks. Instead, the results indicate that higher supply-side costs were passed through to borrowers in the form of higher prices, leading to a contraction in refinancing activity.

To further validate the research design, we estimate a dynamic difference-in-differences specification. Figure 2 plots coefficients from Equations (2) and (4) with 95% confidence intervals. Panel A reports differential trends in loan size between conforming refinance and purchase mortgages, while Panel B reports differential trends in refinancing shares between conforming and non-conforming loans. The specification mirrors Column (5) of Table 3, which includes county-day and lender-day fixed effects. Consistent with the identifying assumption, we find no evidence of differential pre-trends in either outcome. However, following the FHFA announcement, refinancing activity exhibits a sharp and persistent decline, while loan size remains stable throughout both the pre- and post-announcement periods. The absence of pre-trends combined with the stark break in refinancing activity at the time of the announcement reinforces the validity of our research design and the causal interpretation of our results.[10]

5 Market Structure, Lender Power, and Differential Pass-Through

In this section, we explore the mechanism driving our baseline results. We find that our results fail to correlate with measurements of local market competition. Nevertheless, market share appears to predict pass-through, whereby high market share lenders pass through 100% and low market share lenders pass through about 80% of the shock.

[10]Excluding interest rates and discount points as controls does not change the interpretation of our results as causal, as seen in Figure A.3.

5.1 Market Concentration

In this subsection, we ask whether local market structure mediates the pass-through documented in our baseline results. Our strategy exploits a single nationwide shock—the AMR fee—that increased secondary-market costs for refinance loans relative to purchase loans. By comparing refinance loans to purchase loans, while absorbing time-varying local economic conditions common to both loan types, we isolate how pass-through correlates with concentration in response to a plausibly exogenous shock to funding costs. We estimate versions of the following regression using the sample of conforming mortgages:

$$\begin{aligned} Y_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Refinance_i + \delta Refinance_i \times Post_t \\ + \vartheta High\ HHI_c \times Refinance_i \times Post_t + \epsilon_{i,c,t} \end{aligned} \tag{5}$$

In the specification above, $High\ HHI_c$ equals one for above-median pre-period county-level Herfindahl–Hirschman Index (HHI) for county c, weighted by observations. The coefficient δ identifies the effect of the FHFA announcement on conforming refinance mortgages across all counties. Key to the interpretation of our results, ϑ identifies a differential treatment effect conditional on market concentration. Therefore, the coefficients we estimate suggest how local market structure correlates with pass-through when funding costs increase exogenously. We show below that our results using HHI extend to other measures of concentration used in the literature.

Table 4 Panel A presents estimates of ϑ from the regression Equation (5) using interest rates as the outcome of interest. Here, we show the degree to which refinance loans experienced differential changes in prices following the FHFA announcement across local market structure. Across all specifications, the AMR fee raises interests rates by 7 to 9 basis points, with no differential effect across concentrated versus competitive markets. In Column (1), the baseline estimate indicates an 8.5 basis point increase in interest rates for refinance loans after the announcement, significant at the 1% level. This magnitude closely matches Column (1) of Table 2. The corresponding High HHI coefficient estimate is -0.1 basis points and statistically indistinguishable from zero. Columns (2) to (4) introduce borrower- and loan-level controls, county fixed effects, and county-day fixed effects, respectively. Across these specifications, the treatment effect remains tightly estimated between 7.4 and 7.7 basis points, statistically significant at the 1% level and mirroring Table 2. The estimate for the High HHI interaction remains small and imprecise in every case. Finally, Column (5) adds lender-day fixed effects to absorb time-varying, lender-specific shocks. The estimated effect rises modestly to 9.0 bps, again comparable to Table 2. The High HHI interaction stays near

zero and statistically insignificant.

Table 4 Panel B presents estimates of ϑ from the regression Equation (5) using discount points as the outcome of interest. Across all specifications, the AMR fee raises discount points by 18 to 22 basis points, once again with no differential effect across concentrated versus competitive markets. In Column (1), absent controls and fixed effects, we estimate an 18.8 basis point increase in discount points for refinance loans after the announcement, significant at the 1% level. The estimated coefficient for High HHI is 2.9 basis points, statistically indistinguishable from zero and economically small. As in Panel A, Columns (2) to (4) introduce borrower- and loan-level controls, county fixed effects, and county-day fixed effects, respectively. Across these specifications we estimate a treatment effect between 18.2 and 18.9 basis points, statistically significant at the 1% level. The High HHI interaction stays small and imprecise throughout, providing no evidence of differential pass-through in more concentrated counties. Finally, Column (5) introduces lender-day fixed effects to absorb time-varying, lender-specific shocks. The estimated effect increases to 22.4 basis points, again closely aligning with Table 2. The High HHI interaction remains near zero and statistically insignificant.

Taken together, the evidence suggests that while the AMR fee was fully passed through to borrowers, local competition did not shape its incidence on average. However, this result may mask systematic heterogeneity in lender behavior. For example, large lenders may adjust pricing differently in concentrated versus competitive markets, while small lenders may not. In this case, the average effect across all lenders could obscure meaningful differences by size. We therefore test for differential pass-through across geography specifically for larger lenders. Optimal Blue includes an indicator variable that classifies the level of origination volume by a given lender in the previous month. Although lender identities are anonymized, this measure provides a reliable proxy for lender size and enables us to study how pass-through varies with market share.

To this end, we estimate versions of Equation (5) separately for large and small lenders. We define top lenders as those in the top 10 percent of origination volume, with the remaining 90 percent classified as smaller lenders. To place magnitudes on a common scale relative to the 50 basis point AMR fee, we construct an outcome variable that converts rates into points and adds discount points. Let $r_{i,c,t}$ denote the contract rate and $p_{i,c,t}$ the discount points. Let λ be the conversion ratio (discount points per 1 basis point of rate). Define:

$$Percent\ of\ Fee_{i,c,t} \;=\; 100 \times \frac{\lambda\, r_{i,c,t} \;+\; p_{i,c,t}}{50}. \tag{6}$$

Because λ and $p_{i,c,t}$ are both in basis points of the loan amount, coefficients from Equation (5) estimated on $Percent\ of\ Fee_{i,c,t}$ are directly interpretable as the percentage of the 50

bp fee passed through at lock. In practice, we compute λ using pre-period Bloomberg MBS quotes, which imply that a 100 basis point change in note rates corresponds to roughly 3.3164 price points, as described in Section 3. This calculation places rate and point adjustments on a common cost basis, ensuring that the unified measure of pass-through reflects the true economic incidence of the AMR fee.

Figure 3 Panel A plots estimates of Equation (5) where the outcome is the loan cost scaled to the 50 bp AMR fee (see Equation 6). Coefficients are therefore interpretable as the percent of the fee passed through. The coefficient δ captures pass-through in low-HHI counties, while $\delta + \vartheta$ estimates pass-through in high-HHI counties. Black markers represent the full sample, red markers the top-lender subsample, and blue markers the bottom-lender subsample. Vertical bars denote 95 percent confidence intervals clustered at the county level, and the horizontal dashed line indicates the pooled full-sample pass-through estimate without interactions as a benchmark.

Consistent with the preceding subsection, there is no evidence that local concentration mediates pass-through in the aggregate: black markers for high- and low-HHI counties lie close to one another and to the dashed benchmark. The same holds within subsamples split by lender size. For both the top-lender subsample (red) and the bottom-lender subsample (blue), high-HHI counties exhibit no differential pass-through relative to low-HHI counties. Thus, there is little evidence that large lenders behave differently across concentrated and competitive markets. What does emerge clearly, however, is a level difference between the two size groups. Across both high- and low-HHI counties, top lenders pass through essentially the full AMR fee, while smaller lenders pass through roughly 20 percent less. This pattern is robust to the inclusion of borrower and loan controls as well as county-day and lender-day fixed effects.

To study quantities, we estimate an analogous difference-in-differences specification for refinance propensity:

$$\begin{aligned} Refinance_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Conforming_i + \delta Conforming_i \times Post_t \\ + \vartheta High\ HHI_c \times Conforming_i \times Post_t + \epsilon_{i,c,t} \end{aligned} \tag{7}$$

where $Refinance_{i,c,t}$ is an indicator equal to one for refinance loans, $Conforming_i$ indicates conforming eligibility, and $\alpha_{c,t}$ and $\alpha_{l,t}$ denote county-by-day and lender-by-day fixed effects. Here, the coefficient δ captures a change in the refinance share for low-HHI counties, while $\delta + \vartheta$ estimates a change in the refinance share for high-HHI counties. Figure 3 Panel B plots the corresponding estimates with 95% confidence intervals. Refinance activity declines by about 6 percentage points following the AMR fee announcement, with no statistically

meaningful differences between high- and low-HHI counties. This result is unchanged when the regressions are estimated separately for top and bottom lenders. In contrast to the price effects in Panel A, the quantity response does not vary with lender size. Here, the contraction in refinancing activity is essentially equivalent across both size groups and across market concentration, despite the differences in pass-through in prices.

A natural concern is that the null results reflect our choice of concentration measure. To address this, Figure 4 reports estimates using three alternative definitions: above-median market share of the top four lenders in a county (Panels A and B); above-median county-level market share of the four largest lenders nationwide (Panels C and D), analogous to the measures used in the literature by Chen et al. (2017), and D'Acunto and Rossi (2022), among many others; and a deposit–beta–weighted measure of local market concentration (Panels E and F), following the work of Drechsler et al. (2017). Panels A, C, and E present estimates for price outcomes, while Panels B, D, and F report estimates for quantities.

For prices, we find no evidence of differential pass-through between concentrated and competitive markets—whether in the full sample (black markers) or within the top- and bottom-lender subsamples (red and blue markers, respectively). In every case, the estimated differences are economically small and statistically indistinguishable from zero. The quantity response is equally striking: across all subsamples and concentration measures, the decline in refinancing activity is virtually identical and closely aligned with the pooled baseline (dashed line).

Despite the lack of differential pass-through in market structure, across all measures of concentration, we consistently observe a level difference in the point estimates for the top-lender sample relative to the bottom-lender sample. Taken together, these findings confirm that the absence of differential effects is not an artifact of a particular HHI definition. Instead, regardless of how local market power is proxied, concentration does not appear to mediate the incidence of secondary-market cost shocks.

Overall, the evidence shows that the AMR fee produced uniform pass-through across concentrated and competitive markets. This invariance holds within both top- and bottom-lender subsamples. At the same time, pricing differs systematically by lender size. Namely, large lenders consistently transmit the full fee to borrowers, while smaller lenders transmit substantially less. In contrast, the decline in refinancing volumes is uniform across geographies and lender size.

5.2 Lender Size

In the previous section, we examined whether local market structure mediates pass-through. While we found no systematic differences by market concentration, subsample regressions

suggested higher pass-through among top lenders relative to smaller lenders. These differences, however, may simply reflect unobserved heterogeneity: large lenders may be disproportionately active in markets with more inelastic credit demand, mechanically inducing a correlation between size and pass-through absent any underlying mechanism. Because the earlier regressions were estimated separately by lender size, they do not exploit cases in which large and small lenders face equivalent local demand. To address this concern, we next estimate regressions of the following form:

$$Y_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Refinance_i + \delta Refinance_i \times Post_t + \vartheta Top_l \times Refinance_i \times Post_t + \epsilon_{i,c,t} \tag{8}$$

where $Y_{i,c,t}$ represents outcomes for loan i in county c and time t. The dummy variable $Refinance_i$ takes a value of one if a loan i is a refinance loan. The indicator variable $Post_t$ equals one if an outcome is observed after the timing of the FHFA announcement. The Top_l dummy variable equals one if the lender is in the top 10% of lenders by market share and zero otherwise. All regressions include the same covariates as Column (5) of Table 2, county-by-day fixed effects, and lender-by-day fixed effects. Standard errors are clustered at the county level.

In the regression above, the coefficient δ captures pass-through for bottom lenders, while $\delta + \vartheta$ estimates pass-through for top lenders. This design compares pricing across top and bottom lenders originating in the same day and county, ensuring that any level differences do not reflect geographic sorting or common local shocks.

Figure 5 Panel A plots estimates of Equation (8) using the fee-scaled price outcome, expressed as a percent of the 50 basis point AMR fee passed through at the time of lock. The dashed horizontal line shows the pooled benchmark without interactions, and vertical bars report 95 percent confidence intervals clustered at the county level.

In the pooled sample (black markers), top lenders pass through essentially the full AMR fee, while bottom lenders transmit roughly 20 percent less. This difference remains even after accounting for county–day and lender–day shocks, indicating that larger lenders systematically transmit a greater share of funding cost shocks to borrowers. We next ask whether this gap reflects differences in local market concentration. If smaller lenders hold relatively more market power in concentrated markets, their weaker pass-through could reflect reduced markups in high-HHI counties. In contrast to this hypothesis, we find that in high-HHI counties (orange markers) and low-HHI counties (green markers), the same pattern holds across both markets. Namely, large lenders fully pass through the fee regardless of concentration, while smaller lenders consistently pass through less, consistent with national

mortgage pricing (see Begenau and Stafford (2023) for a discussion of uniform pricing of deposits).

Another possibility is that the observed difference by lender size simply reflects lender type. Banks, shown in purple, often have the option to retain loans on balance sheet and may therefore avoid some of the fee, while nonbanks, shown in pink, rely more heavily on loan sales to the GSEs. Under this logic, banks would be expected to pass through less of the AMR fee, whereas nonbanks would need to fully transmit the cost to borrowers given their limited balance sheet capacity. The estimates, however, show the same pattern across both groups: among banks and among nonbanks, large lenders fully pass through the AMR fee, while smaller lenders consistently transmit substantially less.

Taken together, the evidence in Panel A points to a strikingly consistent result. Namely, neither local concentration nor lender type explains the observed heterogeneity. Instead, the distinction arises along lender size, with large lenders fully transmitting the fee and smaller lenders absorbing part of the cost.

Additional evidence from Table A.2 reinforces this conclusion. Here we estimate versions of Equation (5) with interaction terms for $High\ HHI$, Top, and $Nonbank$. All regressions include the same covariates as Column (5) of Table 2, county-by-day fixed effects, and lender-by-day fixed effects, with standard errors clustered at the county level. Column (1) presents the interaction with $High\ HHI$, equal to one for loans rate-locked in more concentrated counties. Consistent with earlier results, the coefficient is statistically indistinguishable from zero. Column (2) presents the interaction with Top, equal to one for loans originated by lenders in the top 10 percent of market share. Here we find that top lenders pass through 30 percent more of the AMR fee relative to smaller lenders. Finally, Column (3) presents estimates for the $Nonbank$ interaction, equal to one for loans originated by mortgage companies. Once again, the differential effect is statistically insignificant relative to banks.

To further unpack these results, Table A.3 separates pricing into interest rates (Panel A) and discount points (Panel B). In Column (1), we find no evidence that high-HHI counties respond differently from low-HHI counties across either margin: estimates for the $High\ HHI$ interaction are small and statistically insignificant for both rates and discount points. In contrast, Column (2) shows that the additional pass-through by top lenders happens in the form of both differentially higher interest rates (1.3 basis points) and higher discount points (9 basis points). Finally, Column (3) highlights a distinct pattern for nonbanks. Relative to all banks (i.e., this result is not specific to the large banks), nonbanks charge differentially lower interest rates (1.6 basis points) but more of the impact of the AMR shows up as an increase in discount points (8.3 basis points). These estimates suggest that nonbanks (as a whole, not just the largest ones) may offer contracts that are equivalent in total cost to

banks but differ in the makeup of that cost: borrowers at nonbanks appear to select into lower-rate, higher-fee contracts when faced with higher funding costs. It is unclear whether this is driven by lender strategy or borrower preferences, but this reallocation across margins reveals meaningful heterogeneity in how secondary-market costs are transmitted.

5.3 Borrower Characteristics

In the preceding subsections, we ruled out two potential explanations for the differential effects across lender size: sorting into concentrated markets and differences in balance sheet capacity that could limit the pass-through of loan costs. We now turn to the possibility that these effects reflect heterogeneity in borrower characteristics. Specifically, we test whether smaller lenders disproportionately serve more financially constrained borrowers, which could induce slower adjustment in loan prices as lenders absorb part of the cost to maintain loan supply. If this mechanism is at play, the pricing differences across lender size documented earlier should attenuate once we condition on borrower credit quality or mortgage loan-to-value ratios.

We classify loans along two observable characteristics: credit risk and leverage. For credit risk, we define five mutually exclusive FICO bins: ≤ 690, ≤ 725, ≤ 765, ≤ 790, and 791+. For leverage, we define five combined loan-to-value (CLTV) bins: ≤ 60, ≤ 75, ≤ 80, ≤ 90, and 91+. We then estimate the pricing regression jointly by interacting the bin indicators with the treatment term so that each bin receives its own pass-through coefficient. Concretely, we augment Equation (1) with

$$\begin{aligned} Y_{i,c,t} = \alpha_{c,t} + \alpha_{l,t} + X'_{i,c,t}\gamma + \beta Refinance_i + \delta Refinance_i \times Post_t \\ + \sum_{s \in \Theta} \vartheta_s \mathbb{1}_s \times Refinance_i \times Post_t + \epsilon_{i,c,t} \end{aligned} \tag{9}$$

where Θ denotes the set of borrower bins (either FICO or CLTV), and $\mathbb{1}_s$ is an indicator for membership in bin s. County-by-day fixed effects $\alpha_{c,t}$ and lender-by-day fixed effects $\alpha_{l,t}$ absorb common local economic conditions and lender-specific shocks at the daily frequency. Standard errors are clustered at the county level. In the specification above, δ is the baseline pass-through for the omitted bin and $\delta + \vartheta_s$ is pass-through for bin s. Because the coefficients are estimated in a single regression, comparisons across bins control for common variation within the same lender-day and county-day variation. Therefore, we are effectively comparing how a given lender prices different borrower types on the same day in the same county. This framework allows us to test whether pricing systematically varies with loan quality. If loan quality shapes pass-through, independent of lender size, then the estimates from the previous

section could be reflecting lenders matching to borrowers with particular FICO and LTV ratios as opposed to something systematic to lender size.

Figure 6 reports fee-scaled price effects (i.e., we combine interest rates and discount points in a percent-of-fee summary measure as in Figures 3, 4, and 5) so that a coefficient of one denotes one-for-one pass-through. Panel A plots estimates across FICO bins and Panel B plots estimates across CLTV bins. Within each bin, black markers show the full-sample estimate, red markers the top-lender subsample, and blue markers the bottom-lender subsample. Standard error bars are 95% confidence intervals clustered at the county level. The horizontal dashed line is the pooled full-sample pass-through from the specification without borrower binning, provided as a visual benchmark.

Before turning to lender size, the striking feature of Figure 6 is the absence of meaningful heterogeneity across borrower bins in the full sample. The black point estimates lie close to the dashed benchmark in every FICO and CLTV category, and their confidence intervals broadly overlap. We see no systematic pattern by credit quality or leverage and no bin in which pass-through materially deviates from the pooled estimate. Thus, conditioning on observable borrower risk and leverage alone does not generate differential pricing.

Comparing subsamples, the size-based gap remains stable across borrower characteristics. In every FICO and CLTV bin, top-lender estimates (red) cluster near full pass-through, whereas bottom-lender estimates (blue) are roughly 15–25 percent lower. The difference does not attenuate in higher-FICO or lower-CLTV segments, and, in fact, there is some suggestive evidence of larger differences for high credit score borrowers.

Overall, Figure 6 indicates that observable borrower characteristics are unlikely to account for the heterogeneity in pass-through for small and large lenders. The evidence is more consistent with a supply-side channel associated with lender size than with differences in the financial constraints of borrowers served by large versus small lenders.

6 Conclusion

This paper exploits an exogenous cost shock in the secondary mortgage market to identify how upstream funding costs are transmitted to borrowers. Using high-frequency mortgage rate-lock data and a quasi-experimental research design, we show that lenders fully pass through the increase in costs, with roughly 58 percent reflected in higher interest rates and 46 percent in upfront discount points. Pass-through is remarkably uniform across geography, borrower characteristics, and lender type, indicating that local market structure and observable demand-side factors do not mediate the incidence of cost shocks.

The key dimension of heterogeneity arises instead along lender size. Large lenders con-

sistently transmit the full cost shock, while smaller lenders pass through substantially less, even when compared within the same markets and at the same time. This size-based differential is not explained by local concentration or by lender type. Rather, it reflects systematic differences in how large versus small lenders adjust pricing when faced with upstream cost changes.

The results suggest that secondary-market cost shocks map cleanly into primary-market mortgage prices, but the burden on households depends on who they borrow from. For policymakers, this implies that interventions in mortgage funding markets will generate broadly uniform effects across geographies, yet their ultimate distributional consequences hinge on the relative role of large versus small lenders. Taken together, the evidence highlights the importance of considering lender size—not just market structure—when evaluating the transmission of credit-market policies to household balance sheets and financial stability.

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Table 1: Summary Statistics for Optimal Blue: Refinance vs. Purchase Loans

	Refinance Loans		Purchase Loans	
	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)
Loan Size (000's)	274.85	131.73	259.43	128.41
Interest Rate	4.09	0.60	4.26	0.55
CLTV	69.34	15.35	82.80	14.43
Price	99.67	1.21	99.75	1.09
DTI $< 36\%$	0.56	0.50	0.51	0.50
15-Year Term	0.16	0.37	0.05	0.22
20-Year Term	0.06	0.24	0.01	0.09
Primary Occupancy	0.91	0.29	0.87	0.34
Single-Family	0.99	0.08	0.99	0.10
Large County	0.47	0.50	0.42	0.49
Observations	770,023		1,044,616	

Note: This table reports mean and standard deviation values of loan characteristics for mortgages rate-locked through the Optimal Blue platform in 2019. Columns (1) and (2) report statistics for refinance mortgages. Columns (3) and (4) report statistics for purchase mortgages. Loan characteristics include loan size (in thousands of dollars), the original interest rate, the combined loan-to-value ratio, and the price of the loan as a percent of par value. Other characteristics include indicator variables for mortgages with a debt-to-income ratio below 36%, a 15- or 20-year loan term, primary occupancy status, single-family property status, and a property within the top 100 largest counties. Mortgages are restricted to conforming non-jumbo loans with a loan-to-value ratio below 105, loan size below $1 million, interest rate below 10%, loan term of either 15, 20, or 30 years, and prices between 90 and 110.

Table 2: Effect of FHFA Announcement on Prices: Difference-in-Differences Estimates

	Prices				
	(1)	(2)	(3)	(4)	(5)
Panel A: Interest Rates					
Refinance	-0.083***	0.078***	0.074***	0.072***	0.082***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Refinance× Post	0.084***	0.073***	0.075***	0.077***	0.088***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Observations	399,259	399,259	399,259	399,259	399,259
Panel B: Discount Points					
Refinance	-0.130***	-0.040***	-0.048***	-0.052***	0.073***
	(0.013)	(0.011)	(0.010)	(0.011)	(0.008)
Refinance× Post	0.203***	0.195***	0.199***	0.202***	0.229***
	(0.010)	(0.010)	(0.010)	(0.011)	(0.008)
Observations	399,259	399,259	399,259	399,259	399,259
Borrower Controls		Yes	Yes	Yes	Yes
Loan Controls		Yes	Yes	Yes	Yes
County			Yes		
County-Day				Yes	Yes
Lender-Day					Yes

Note: This table reports difference-in-differences estimates of the effect of the FHFA announcement of the AMR fee on interest rates and discount points. Observations are at the loan level. In Panel A, the outcome variable equals the interest rate on a mortgage at the time of a rate-lock. In Panel B, the outcome variable equals the discount rate on a mortgage at the time of a rate-lock. The outcome variable is multiplied by 100 in order to interpret coefficients as percentage point changes. Columns 1 to 5 report estimates from difference-in-differences regressions that control for refinance status over time. The Refinance dummy takes a value of one if the loan is a refinance mortgage. The Post dummy takes a value of one if a loan is rate-locked on or after the minute of the announcement (August 12, 2020, 7:30PM EST). Standard errors are reported in parentheses and are clustered at the county level. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively. Data covers the period of a 13-day window around the time of the announcement. The sample includes conforming non-jumbo refinance and purchase mortgages.

Table 3: Effect of FHFA Announcement on Quantities: Difference-in-Differences Estimates

	Quantities					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Log(Loan Amount)						
Refinance	0.023*	0.133***	0.069***	0.065***	0.069***	0.053***
	(0.013)	(0.009)	(0.004)	(0.004)	(0.004)	(0.004)
Refinance× Post	-0.028***	-0.006	0.005	-0.001	0.000	-0.021***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
Observations	399,259	399,259	399,259	399,259	399,259	399,259
Panel B: Refinance Share						
Conforming	40.878***	4.658***	4.685***	4.641***	5.180***	8.440***
	(0.647)	(0.494)	(0.484)	(0.512)	(0.528)	(0.473)
Conforming× Post	-6.885***	-4.704***	-4.602***	-4.629***	-5.458***	-4.554***
	(0.362)	(0.305)	(0.302)	(0.341)	(0.343)	(0.335)
Observations	492,841	492,841	492,841	492,841	492,841	492,841
Borrower Controls		Yes	Yes	Yes	Yes	Yes
Loan Controls		Yes	Yes	Yes	Yes	
County			Yes			
County-Day				Yes	Yes	Yes
Lender-Day					Yes	Yes

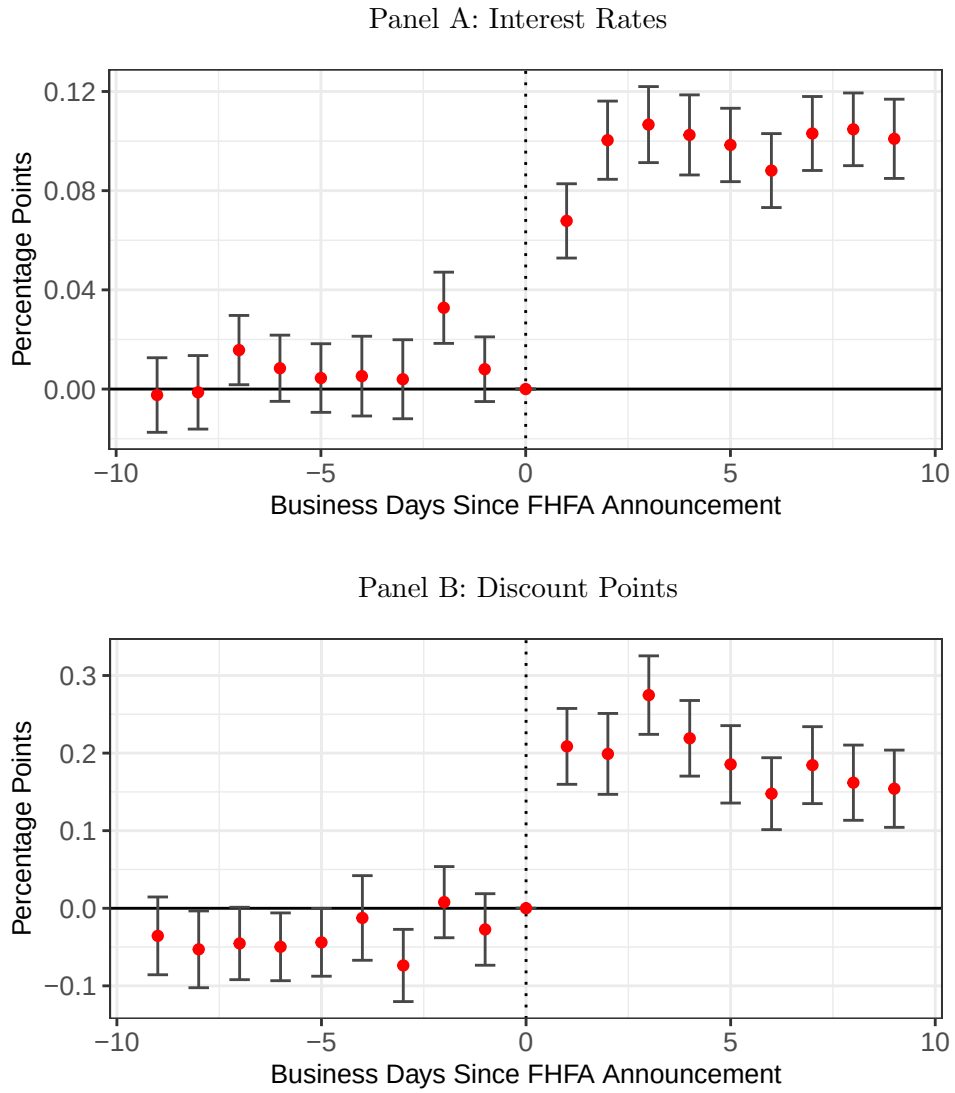
Note: This table reports difference-in-differences estimates of the effect of the FHFA announcement of the AMR fee on loan amounts and refinance shares. Observations are at the loan level. In Panel A, the outcome variable equals the log of the loan amount on a mortgage at the time of a rate-lock. In Panel B, the outcome variable equals one for refinancings. The outcome variable in Panel B is multiplied by 100 in order to interpret coefficients as percentage point changes. Columns 1 to 6 report estimates from difference-in-differences regressions that control for treatment status over time. The Refinance dummy takes a value of one if the loan is a refinance mortgage. The Conforming dummy takes a value of one if a loan is a conforming mortgage. The Post dummy takes a value of one if a loan is rate-locked on or after the minute of the announcement (August 12, 2020, 7:30PM EST). Standard errors are reported in parentheses and are clustered at the county level. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively. Data covers the period of a 13-day window around the time of the announcement. The sample in Panel A includes only conforming non-jumbo refinance and purchase mortgages. The sample in Panel B further includes non-jumbo FHA, VA, and USDA insured loans as control groups.

Table 4: Effect of FHFA Announcement on Prices Across HHI

	Prices				
	(1)	(2)	(3)	(4)	(5)
Panel A: Interest Rates					
Refinance× Post	0.085***	0.074***	0.075***	0.077***	0.090***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Refinance× High HHI× Post	-0.001	-0.003	0.000	-0.001	-0.005
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Observations	399,258	399,258	399,258	399,258	399,258
Panel B: Discount Points					
Refinance× Post	0.188***	0.182***	0.186***	0.189***	0.224***
	(0.016)	(0.015)	(0.014)	(0.015)	(0.010)
Refinance× High HHI× Post	0.029	0.026	0.027	0.027	0.010
	(0.020)	(0.020)	(0.018)	(0.020)	(0.014)
Observations	399,258	399,258	399,258	399,258	399,258
Borrower Controls		Yes	Yes	Yes	Yes
Loan Controls		Yes	Yes	Yes	Yes
County			Yes		
County-Day				Yes	Yes
Lender-Day					Yes

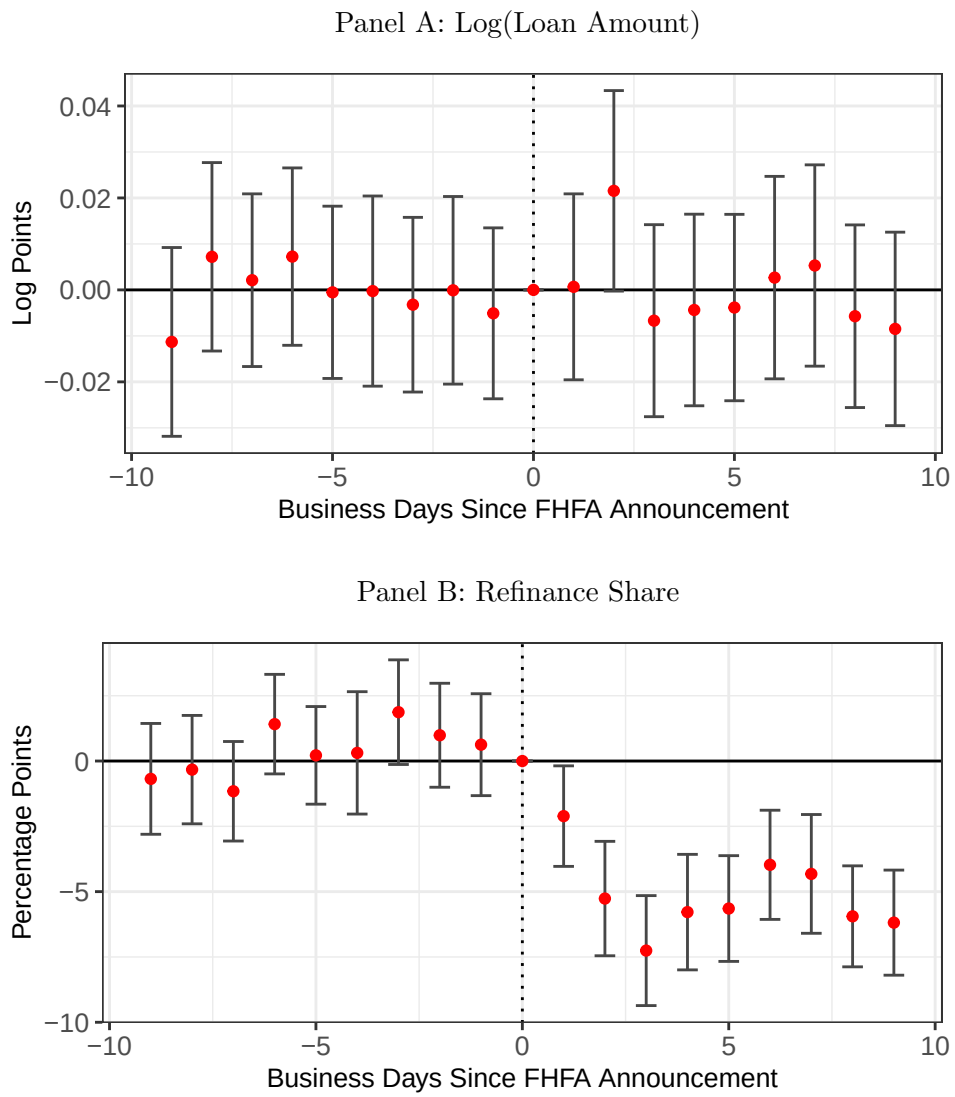
Note: This table reports triple difference estimates of the effect of the FHFA announcement of the AMR fee on interest rates and discount points. Observations are at the loan level. In Panel A, the outcome variable equals the interest rate on a mortgage at the time of a rate-lock. In Panel B, the outcome variable equals the discount rate on a mortgage at the time of a rate-lock. The outcome variable is multiplied by 100 in order to interpret coefficients as percentage point changes. Columns 1 to 5 report estimates from difference-in-differences regressions that control for refinance status and local concentration over time. The Refinance dummy takes a value of one if the loan is a refinance mortgage. The High HHI dummy takes a value of one if a loan is rate-locked in a county with above-median HHI. The Top dummy takes a value of one if a loan is rate-locked by a lender within the top 10% of lenders by lending volume. The Nonbank dummy takes a value of one if a loan is rate-locked by a mortgage company as identified by Optimal Blue. All two-way interactions are included but omitted from the table. The Post dummy takes a value of one if a loan is rate-locked on or after the minute of the announcement (August 12, 2020, 7:30PM EST). Standard errors are reported in parentheses and are clustered at the county level. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively. Data covers the period of a 13-day window around the time of the announcement. The sample includes conforming non-jumbo refinance and purchase mortgages.

Figure 1: Changes in Prices: Interest Rates and Discount Points



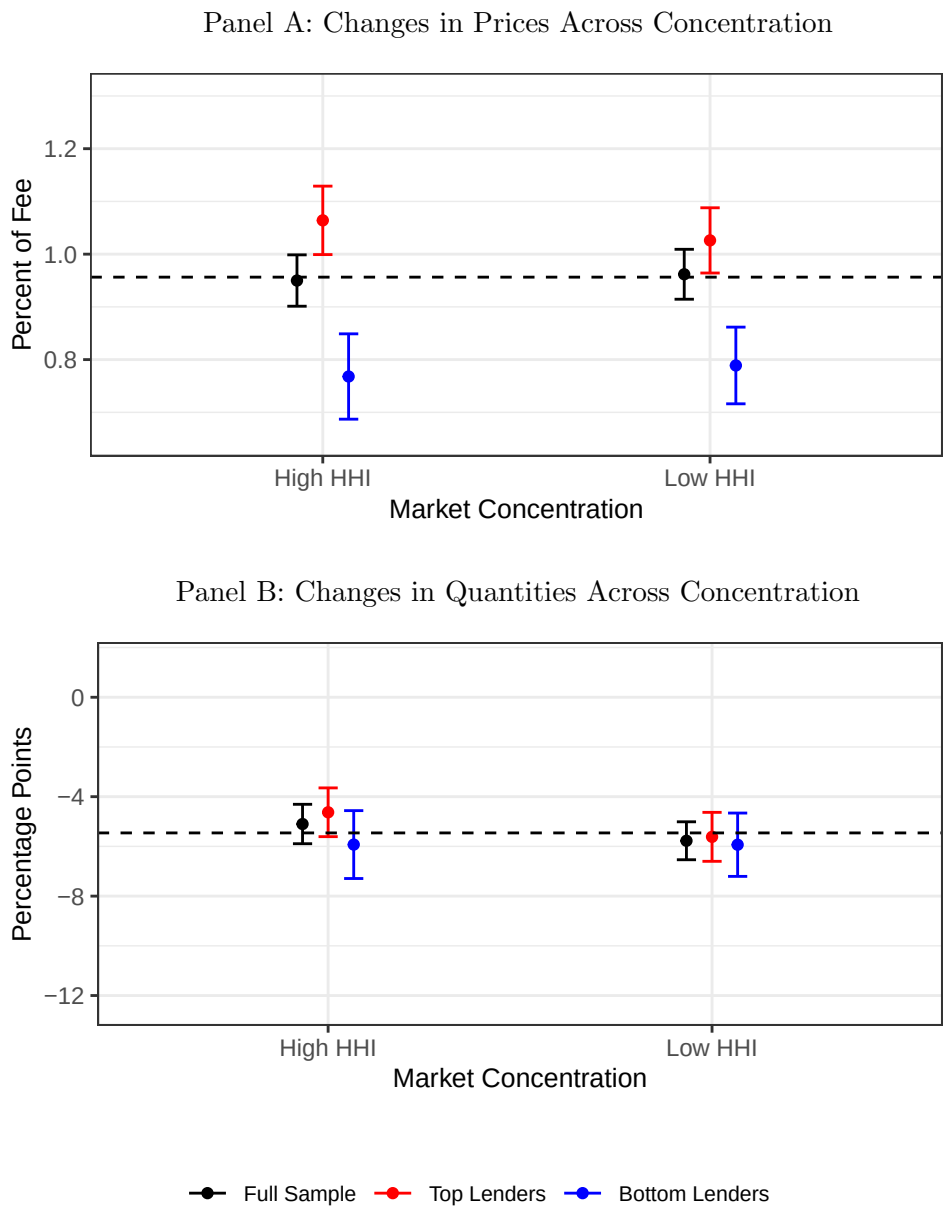
Note: This figure plots estimates from a dynamic difference-in-differences specification corresponding to Column (5) in Table 2. Panel A shows changes in offered interest rates around the FHFA announcement, while Panel B shows changes in offered discount points over the same window. Each red dot corresponds to the estimated effect on the day indicated on the horizontal axis, with vertical bars denoting 95% confidence intervals (clustered by county). The vertical dotted line marks the day preceding the FHFA announcement (August 12, 2020, 7:30 PM EST). Weekend observations are pooled with their nearest business day. The sample includes conforming non-jumbo refinance and purchase mortgages rate-locked using Optimal Blue, as in Table 2.

Figure 2: Changes in Quantities: Balance and Refinance Share



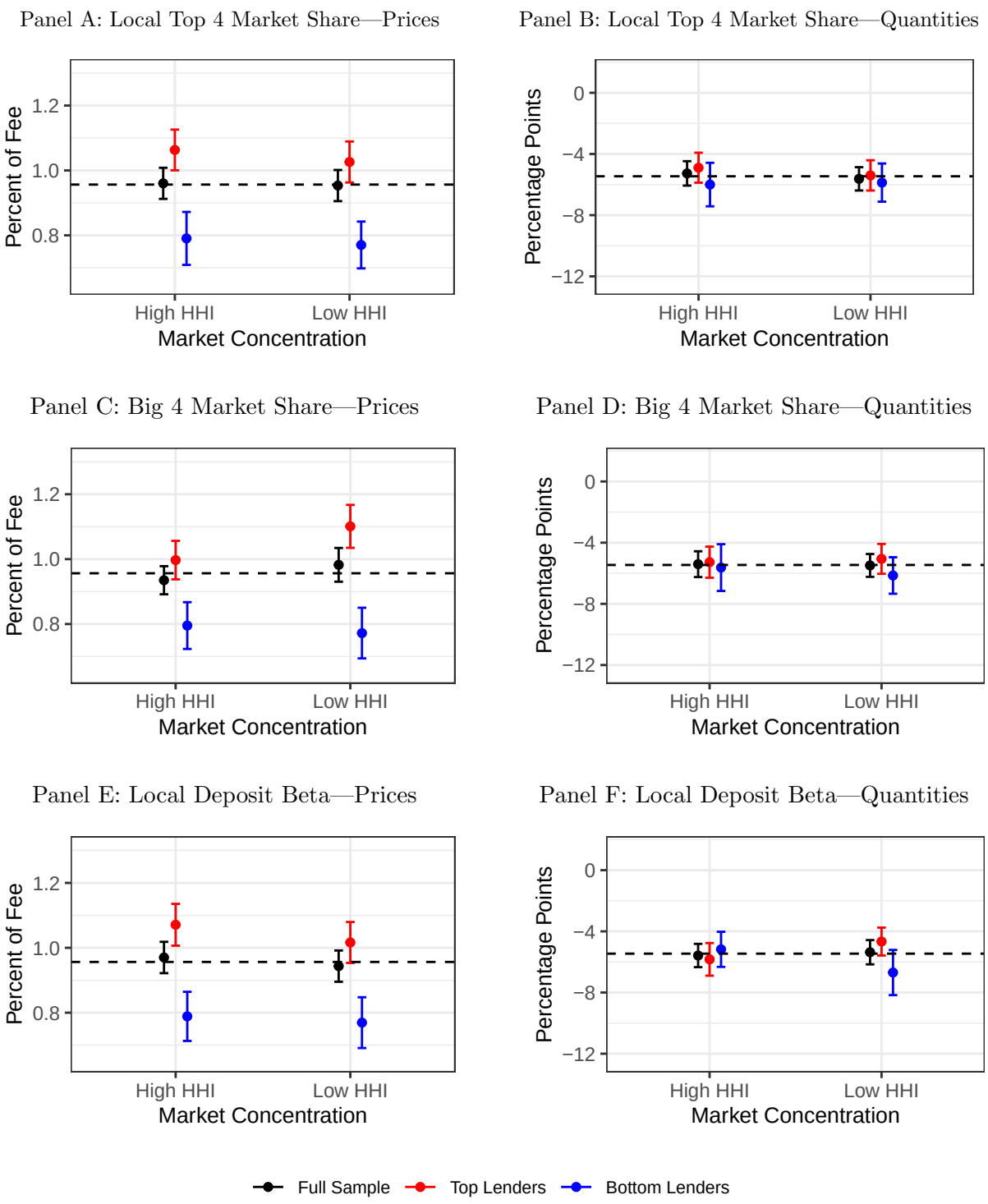
Note: This figure presents the dynamic difference-in-differences estimates corresponding to Column (5) in Table 3. Panel A shows changes in log(loan amount) around the FHFA announcement, while Panel B shows changes in the refinance share over the same window. Each red dot corresponds to the estimated effect on the day indicated on the horizontal axis, with vertical bars denoting 95% confidence intervals (clustered by county). The vertical dotted line marks the day preceding the FHFA announcement (August 12, 2020, 7:30 PM EST). Weekend observations are pooled with their nearest business day. The sample in Panel A includes only conforming non-jumbo refinance and purchase mortgages. The sample in Panel B further includes non-jumbo FHA, VA, and USDA insured loans.

Figure 3: Changes in Prices and Quantities Across Concentration



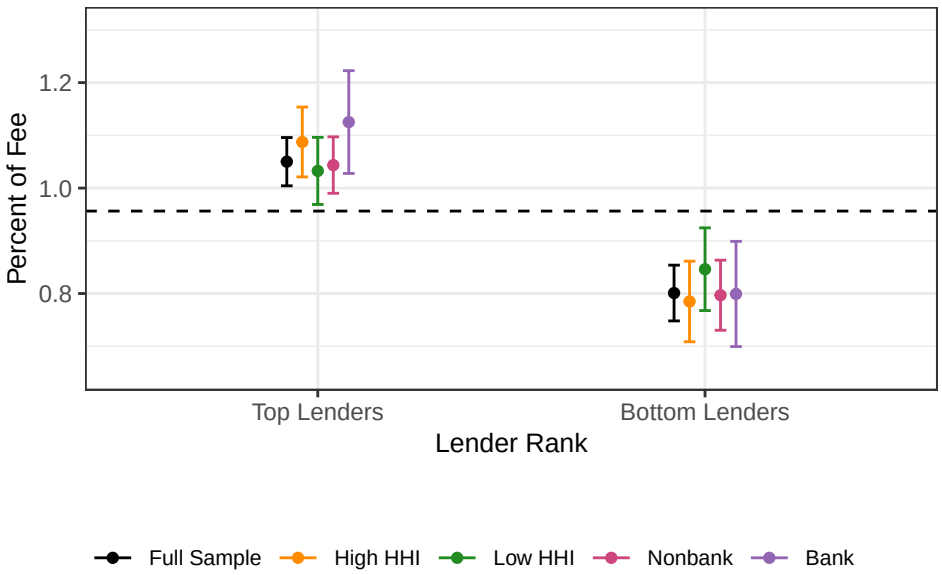
Note: This figure presents difference-in-differences estimates for alternative subsamples. Panel A measures changes in the implied rate across local market concentration. Panel B measures changes in the refinance share across local market concentration. Top Lender equals one if a loan is originated by a lender in the top 10% of lenders by lending volume. Bottom Lender equals one if a loan is originated by a lender in the bottom 90% of lenders by lending volume. Each colored marker indicates a regression for a separate subgroup: loans part of the full sample (black), loans originated by a lender in the top 10% of lenders by lending volume (red), and loans originated by a lender in the bottom 90% of lenders by lending volume (blue). Vertical bars represent 95% confidence intervals (clustered by county). The dashed horizontal line marks the baseline estimate with no interaction across the entire sample.

Figure 4: Changes in Prices and Quantities Across Alternative HHI Measures



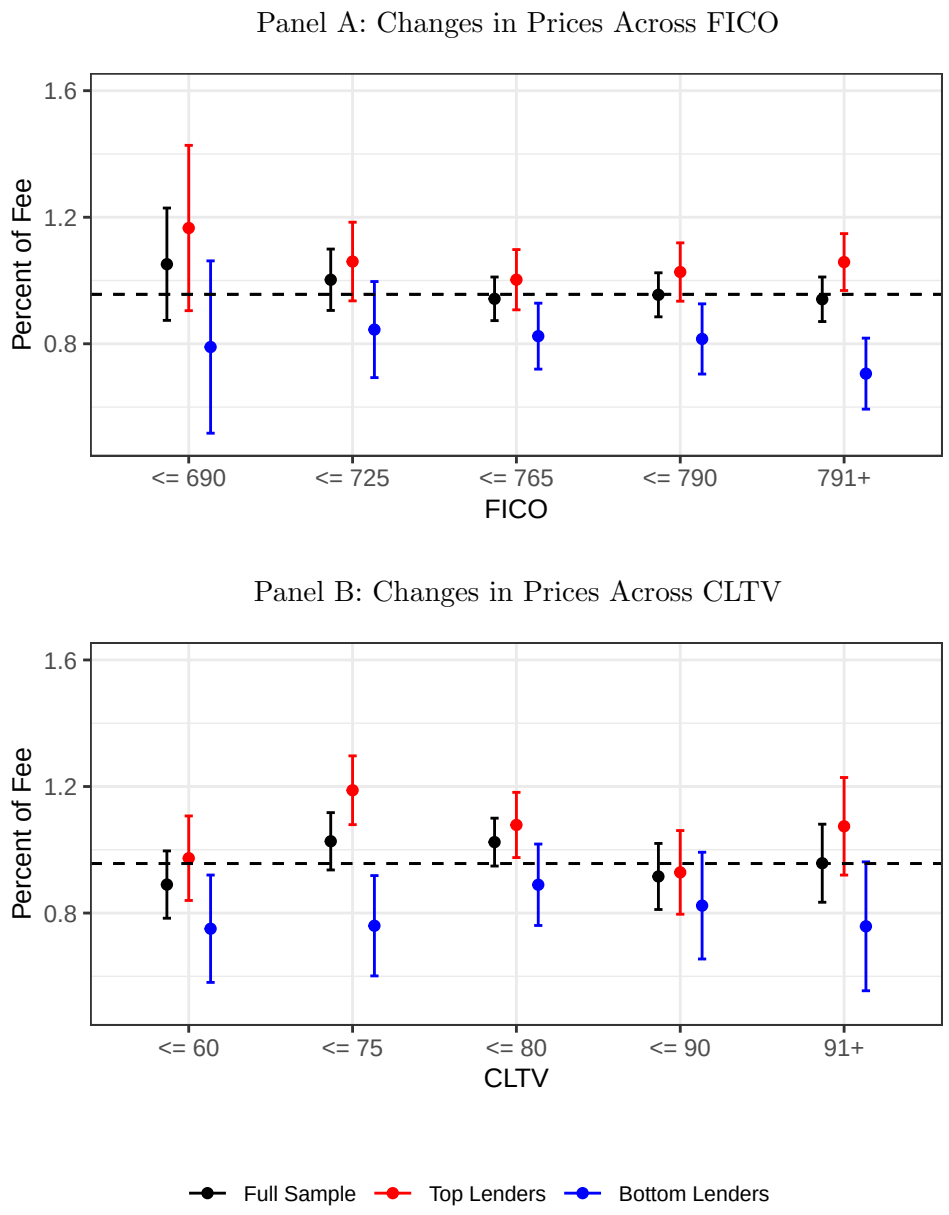
Note: This figure repeats the regressions in Figure 3 for three alternative definitions of market share. Panels A and B use the market share of the top 4 lenders in a given county. Panels C and D use the market share of the top 4 lenders across the entire country within each county. Panels E and F measure a volume-weighted average of lender deposit betas.

Figure 5: Changes in Prices Across Lender Size



Note: This figure presents difference-in-differences estimates for alternative subsamples. The estimates measure changes in the implied rate across lender size. Top Lender equals one if a loan is originated by a lender in the top 10% of lenders by lending volume. Bottom Lender equals one if a loan is originated by a lender in the bottom 90% of lenders by lending volume. Each colored marker indicates a regression for a separate subgroup: loan originated across the entire sample (black), in high hhi counties (orange), in low hhi counties (green), by nonbanks (pink), and by banks (purple). Vertical bars represent 95% confidence intervals (clustered by county). The dashed horizontal line marks the baseline estimate with no interaction across the entire sample.

Figure 6: Changes in Price Across Borrower Characteristics



Note: This figure presents difference-in-differences estimates of how mortgage prices vary with FICO score (Panel A) and CLTV (Panels B). Estimates measure changes in an implied interest rate as percent of the AMR fee. Each colored marker indicates a regression for a separate subgroup: loans part of the full sample (black), loans originated by a lender in the top 10% of lenders by lending volume (red), and loans originated by a lender in the bottom 90% of lenders by lending volume (blue). Vertical bars represent 95% confidence intervals (clustered by county). The dashed horizontal line marks the baseline estimate with no interaction across the entire sample.

A Appendix: Additional Figures

Table A.1: Bloomberg MBS Prices and Implied Trade-Off Factors

Date	FNCL 2.5	FNCL 2.0	Difference	Trade-Off
(1)	(2)	(3)	(4)	(5)
08/11/2020	104.969	103.113	1.855	3.711
08/10/2020	105.156	103.422	1.734	3.469
08/07/2020	105.031	103.258	1.773	3.547
08/06/2020	105.047	103.422	1.625	3.250
08/05/2020	104.906	103.266	1.641	3.281
08/04/2020	105.074	103.504	1.570	3.141
08/03/2020	105.027	103.453	1.570	3.141
07/31/2020	104.875	103.348	1.527	3.055
07/30/2020	104.922	103.328	1.594	3.188
07/29/2020	104.719	103.027	1.691	3.383

Note: This table reports daily Bloomberg quotes for MBS coupons trading closest to par in August 2020. See Section 3 for the definition of this variable and details on the quoted securities. Column (2) and Column (3) list the respective prices of the 2.5 and 2.0 coupons in decimal format. Column (4) reports their difference, corresponding to a 50 basis point change in note rates. Column (5) scales this value by two to obtain the implied 100 basis point trade-off.

Table A.2: Effect of FHFA Announcement Across HHI, Size, and Type

	Percent of Fee		
	(1)	(2)	(3)
Refinance× Post	0.962***	0.801***	0.911***
	(0.029)	(0.032)	(0.041)
Refinance× High HHI× Post	-0.012		
	(0.041)		
Refinance× Top× Post		0.249***	
		(0.043)	
Refinance× Nonbank× Post			0.055
			(0.050)
Observations	399,258	399,259	399,259
Borrower Controls	Yes	Yes	Yes
Loan Controls	Yes	Yes	Yes
County-Day	Yes	Yes	Yes
Lender-Day	Yes	Yes	Yes

Note: This table reports difference-in-differences estimates of the effect of the FHFA announcement of the AMR fee on implied interest rates. An implied interest rate is the counter-factual interest rate if a borrower selected zero discount points. Implied interest rates equal the observed interest rate plus the observed discount points scaled by four. Observations are at the loan level. The outcome is scaled by the implied interest rate size of the AMR fee (12.5 basis points) in order to interpret coefficients as percent of fee changes. Columns 1 to 3 report estimates from difference-in-differences regressions that control for refinance status over time. The Refinance dummy takes a value of one if the loan is a refinance mortgage. The High HHI dummy takes a value of one if a loan is rate-locked in a county with above-median HHI. The Top dummy takes a value of one if a loan is rate-locked by a lender within the top 10% of lenders by lending volume. The Nonbank dummy takes a value of one if a loan is rate-locked by a mortgage company as identified by Optimal Blue. All two-way interactions are included but omitted from the table. The Post dummy takes a value of one if a loan is rate-locked on or after the minute of the announcement (August 12, 2020, 7:30PM EST). Borrower controls include FICO score, CLTV, DTI, and indicators for a fixed mortgage, a primary residence, a single-family property, a 15-year term and a 20-year term. Excluding the outcome variable, loan-level controls include log of the loan amount, interest rate, and discount points. Standard errors are reported in parentheses and are clustered at the county level. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively. Data covers the period of a 13-day window around the time of the announcement. The sample includes conforming non-jumbo refinance and purchase mortgages.

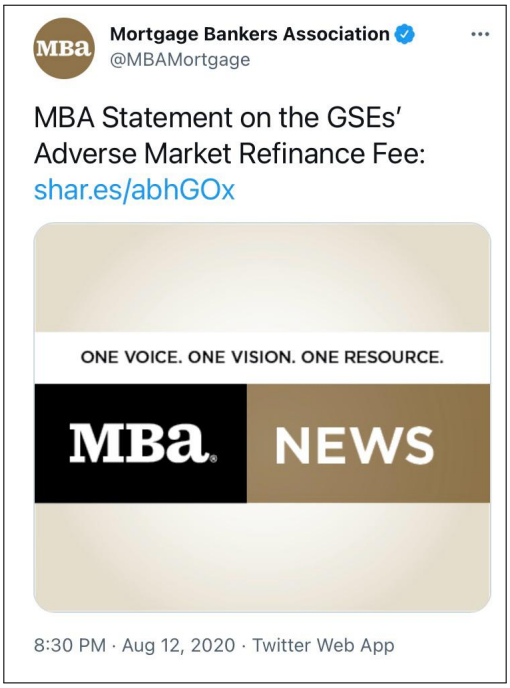
Table A.3: Effect of FHFA Announcement on Prices Across HHI, Size, and Type

	Prices		
	(1)	(2)	(3)
Panel A: Interest Rates			
Refinance× Post	0.090***	0.080***	0.100***
	(0.003)	(0.004)	(0.005)
Refinance× High HHI× Post	-0.005		
	(0.005)		
Refinance× Top× Post		0.013***	
		(0.005)	
Refinance× Nonbank× Post			-0.016**
			(0.006)
Observations	399,258	399,259	399,259
Panel B: Discount Points			
Refinance× Post	0.224***	0.171***	0.165***
	(0.010)	(0.011)	(0.012)
Refinance× High HHI× Post	0.010		
	(0.014)		
Refinance× Top× Post		0.092***	
		(0.014)	
Refinance× Nonbank× Post			0.083***
			(0.015)
Observations	399,258	399,259	399,259
Borrower Controls	Yes	Yes	Yes
Loan Controls	Yes	Yes	Yes
County-Day	Yes	Yes	Yes
Lender-Day	Yes	Yes	Yes

Note: This table reports triple difference estimates of the effect of the FHFA announcement of the AMR fee on interest rates and discount points. Observations are at the loan level. In Panel A, the outcome variable equals the interest rate on a mortgage at the time of a rate-lock. In Panel B, the outcome variable equals the discount rate on a mortgage at the time of a rate-lock. The outcome variable is multiplied by 100 in order to interpret coefficients as percentage point changes. Columns 1 to 3 report estimates from difference-in-differences regressions that control for refinance status and local concentration over time. The Refinance dummy takes a value of one if the loan is a refinance mortgage. The High HHI dummy takes a value of one if a loan is rate-locked in a county with above-median HHI. The Top dummy takes a value of one if a loan is rate-locked by a lender within the top 10% of lenders by lending volume. The Nonbank dummy takes a value of one if a loan is rate-locked by a mortgage company as identified by Optimal Blue. All two-way interactions are included but omitted from the table. The Post dummy takes a value of one if a loan is rate-locked on or after the minute of the announcement (August 12, 2020, 7:30PM EST). Standard errors are reported in parentheses and are clustered at the county level. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively. Data covers the period of a 13-day window around the time of the announcement. The sample includes conforming non-jumbo refinance and purchase mortgages.

Figure A.1: Timing of FHFA Announcements

Panel A: First Mention of AMR Fee

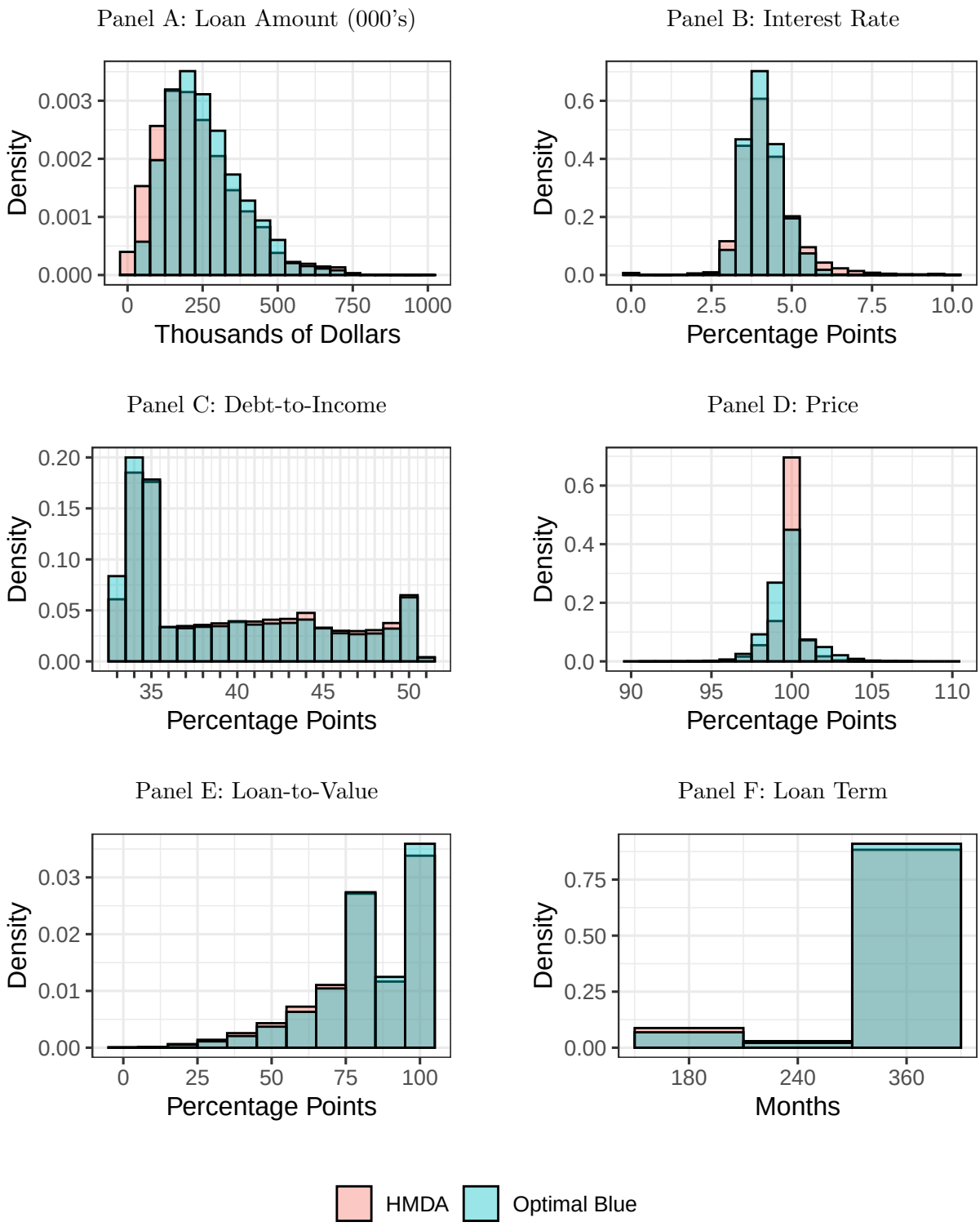


Panel B: First Mention of FHFA Reversal



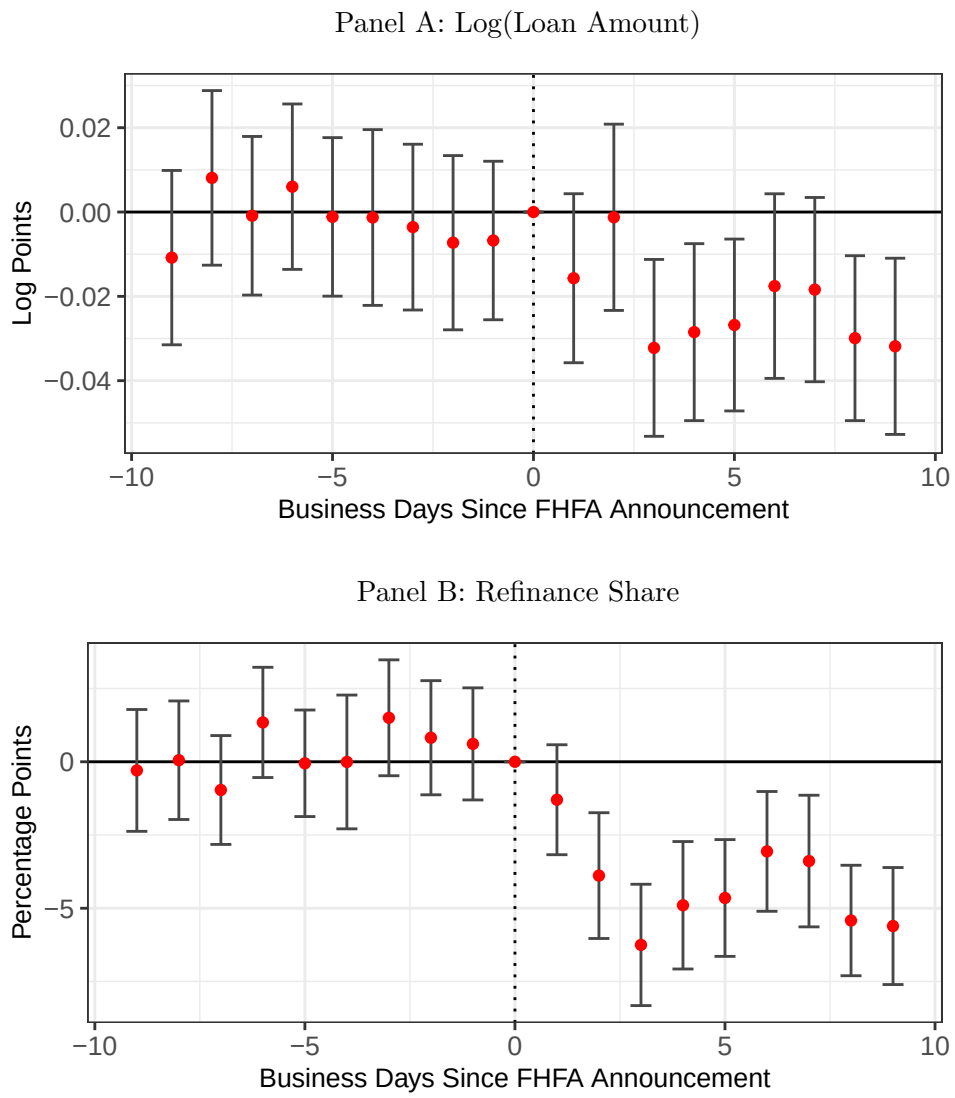
Note: This figure displays initial responses to FHFA announcements on Twitter. Panel A reports the time stamp for the Mortgage Banker's Association response to the FHFA's initial announcement regarding the AMR fee. Panel B reports the time stamp for a reponse by the CFA of Bankrate.com regarding the FHFA's reversal on the AMR fee's timing.

Figure A.2: Distributions of Key Mortgage Variables for Optimal Blue vs. HMDA



Note: This figure displays histograms of loan characteristics across Optimal Blue and HMDA samples. Both samples are restricted to conforming non-jumbo loans rate-locked or originated in 2019, as described in Section 3. The HMDA sample includes only loans sold after origination.

Figure A.3: Alternative Specfication for Changes in Quantities: Balance and Refinance Share



Note: This figure presents the dynamic difference-in-differences estimates corresponding to Column (6) in Table 3. Panel A shows changes in log(loan amount) around the FHFA announcement, while Panel B shows changes in the refinance share over the same window. Each red dot corresponds to the estimated effect on the day indicated on the horizontal axis, with vertical bars denoting 95% confidence intervals (clustered by county). The vertical dotted line marks the day preceding the FHFA announcement (August 12, 2020, 7:30 PM EST). Weekend observations are pooled with their nearest business day. The sample in Panel A includes only conforming non-jumbo refinance and purchase mortgages. The sample in Panel B further includes non-jumbo FHA, VA, and USDA insured loans.