The Rise of Nonbanks and the Quality of Post-Origination Mortgage Servicing *

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Abstract

We find that as nonbanks' market share increases in a local residential mortgage market, the quality of their post-origination mortgage servicing improves significantly in this market. Two instrumental variable analyses exploiting (1) stress tests conducted by the Federal Reserve, and (2) mortgage industry surety bonds required by each state confirm this finding. Evidence suggests that the quality improvement is likely due to nonbanks' increased specialization in servicing lower-income borrowers and investment in technology. The overall quality of post-origination mortgage servicing provided by all lenders in the local market also improves as nonbanks' market share increases.

Keywords: Mortgage servicing, Quality of financial service, Nonbanks

JEL classification: G21, G23, L13, L15

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1 Introduction

Nonbanks, including FinTech lenders, have been growing rapidly since the recovery from the Global Financial Crisis (GFC). In particular, nonbanks have achieved a substantial presence in the U.S. residential mortgage market. For example, in 2018, they accounted for 47% of the mortgage origination and 35% of the post-origination mortgage servicing.[1] This substantial growth of nonbanks raises one important question: How does the expansion of nonbanks in the mortgage market impact consumers?

To answer this question, the existing literature predominantly focuses on the origination stage of mortgages. Specifically, the literature provides evidence that nonbanks increase mortgage access for lower-income and less creditworthy borrowers, whereas the evidence regarding the effects on the cost of mortgages is mixed (e.g., Buchak et al. 2018; Jagtiani et al. 2021).

Different from the prior literature, in this paper, we attempt to shed light on this question by focusing on the post-origination stage of mortgages and examining nonbanks' quality of mortgage servicing after origination. Our goal is to understand the evolution of the quality of nonbanks' post-origination mortgage servicing in a local residential mortgage market as nonbanks increase their presence in this market.

Our study, therefore, complements the existing studies by extending our understanding of the impact of nonbanks' growth on consumers beyond the origination stage of mortgages. Such evidence should be especially relevant for policymakers and regulators, considering the ongoing discussions on the regulation of nonbanks. Despite increasing credit access for lower-income borrowers, if the rise of nonbanks is accompanied by deteriorated servicing quality, the evidence may indicate potential exploitation of lower-income borrowers by nonbanks. However, if the rise of nonbanks is accompanied by improved servicing quality, then the expansion of this sector of the market may provide a valuable channel for lower-income

[1] These nonbank market shares are computed based on a sample of mortgage lenders that are included in both the Home Mortgage Disclosure Act (HMDA) and Mortgage-Backed Securities OnLine (eMBS) datasets.

borrowers to gain financial access and build wealth through home ownership.

Ex ante, it is not obvious whether and in which direction nonbanks' quality of post-origination mortgage servicing would change as their market share increases. If nonbanks exploit lower-income borrowers who lack other sources of financing, the quality of mortgage servicing by nonbanks may not change or even deteriorate as nonbanks become more dominant in the local market. However, as their market share grows, if nonbanks learn to better serve their customers through, for example, developing a specialty in servicing lower-income borrowers or investing in advanced technology, then servicing quality facing nonbank customers could improve.

Admittedly, measuring the quality of mortgage servicing and differentiating between service quality at the loan origination stage and that at the post-origination stage are challenging. In this paper, we follow recent literature that utilizes mortgage-related complaints filed with the Consumer Financial Protection Bureau (CFPB) (e.g., Begley and Purnanandam 2021) to measure the quality of financial services in the mortgage market. Important to our research purpose, CFPB discloses specific issues related to each complaint, allowing us to filter out complaints related to post-origination mortgage servicing. Moreover, the complaints that we analyze capture an important and unique aspect of mortgage servicing quality—the direct feedback from mortgage borrowers about their poor experiences with financial institutions after mortgage origination. Based on these complaints, our measure of nonbanks' post-origination mortgage servicing quality is the servicing-related complaint ratio, which is the number of mortgage servicing-related complaints filed against nonbanks divided by the number of outstanding mortgages originated by nonbanks in the local market.

We follow prior literature (e.g., Buchak et al. 2018) and define nonbanks as mortgage lenders other than traditional deposit-taking banks. Although the focus of our study is post-origination mortgage servicing, we rely on mortgage origination information from HMDA to estimate nonbanks' market share. This empirical choice is appropriate because, despite the fact that comprehensive data on mortgage servicing are not available, nonbanks' market

share of mortgage origination and that of post-origination servicing in the local mortgage market are highly (above 90%) correlated.[2]

We find that as nonbanks' market share increases in a county, their servicing-related complaint ratio in the county decreases. This effect is economically large—a one standard deviation increase in nonbanks' market share is associated with a 20% reduction in nonbanks' servicing-related complaint ratio in the county. Importantly, we obtain this result with the inclusion of county and year fixed effects. County fixed effects absorb any time-invariant county characteristics and alleviate the concern that some uncontrolled time-invariant county characteristics drive both nonbank market share and complaint ratio. Year fixed effects mitigate the concern that our results are due to potential time trends in complaint ratios and nonbank market shares, especially if we consider the possibilities that consumers become more familiar with the CFPB and therefore file more complaints over time, or that financial institutions become better at avoiding having complaints filed against them over time.

One issue in interpreting our results is whether time-varying county characteristics or local economic dynamics drive our results. To strengthen our identification, we use two complementary instrumental variable (IV) strategies. The first IV exploits Federal Reserve's stress tests and the second IV exploits the variation in mortgage industry surety bonds required by each state. We use these two IVs to instrument the *within-county change* in nonbanks' market shares and examine its effect on the *within-county change* in servicing-related complaint ratios. Considering that stress tests and surety bonds may have a direct impact on servicing quality, we carefully design our IV analysis and conduct a battery of robustness tests to make sure our identifying strategy is valid. Both IV analyses confirm our main finding.

How do nonbanks improve their servicing quality? We explore two potential explanations

[2]Using various samples, we show that the correlation between nonbanks' market share of mortgage origination and that of post-origination servicing is over 90%. Although nonbanks mostly use the originate-to-distribute model of lending, they frequently remain the servicing entity after the sale of mortgages to various third parties. Even in situations where nonbanks sell mortgage servicing rights, they typically sell those rights to other nonbanks. Therefore, mortgages that are originated by nonbanks are likely serviced by nonbanks. Please see Section 3.2 for more discussions.

for the reduction in nonbanks' servicing-related complaint ratio as they gain a greater market share. First, we investigate whether nonbanks are likely to develop a specialty in servicing lower-income borrowers as their market share increases. Supportive of this conjecture, we find that as nonbanks increase market share in the local mortgage market, they increasingly serve lower income borrowers—their average borrower income becomes lower and shows less dispersion. Previous literature documents that the average borrower income of nonbanks is lower than that of traditional banks (Buchak et al. 2018). Our finding is novel and extends the prior finding by showing that as nonbanks increase their market share, they become increasingly focused on lower-income borrowers. Similar to the private equity/debt funds that specialize in providing loans to distressed companies and helping them restructure out of distressed situations (DePonte 2010), our evidence suggests that specialization allow nonbank mortgage lenders to develop a deeper understanding of lower-income borrowers' needs and to be better equipped to solve these customers' issues, resulting in fewer complaints (Hernandez et al. 2015).

Consistent with this lender specialization explanation, we find that the average income of traditional banks' borrowers in the county increases as nonbank market share increases. Begley and Purnanandam (2021) document that higher-income borrowers are likely of higher credit quality and are less likely to receive low-quality services that result in filing complaints. Consistently, we find that servicing-related complaint ratio of traditional banks also decreases as nonbanks' market share increases in the county, contributing to an overall reduction in the servicing-related complaint ratio of the local mortgage market.

Critical to the lender specialization explanation is whether nonbanks indeed become better at servicing lower-income borrowers. We examine detailed complaint issues and find that complaints against nonbanks about issues related to difficulties in making mortgage payments—complaints that are likely filed by lower-income borrowers—are significantly reduced as nonbanks' market share increases. Taken together, the evidence is consistent with the idea that, as their market share increases, nonbanks develop a specialty in offering better

mortgage servicing to lower-income borrowers.[3]

Second, we investigate whether nonbanks are likely to invest in technology to improve their servicing quality as their market share increases (Fuster et al. 2019). We test this conjecture by first examining nonbanks' incentives to invest. Specifically, because the marginal cost of technology investment is decreasing, nonbanks in a local county may have more incentives to invest in technology if their market shares increase not only in the focal county but also in the entire nation, allowing them to take advantage of the economies of scale. Using a two-stage regression model, we find evidence that the increased market share of nonbanks in a county is positively associated with their incentives to invest, resulting in a lower servicing-related complaint ratio for nonbanks in the county. Further lending support to this explanation, we find that as nonbanks' market share increases in a county, nonbanks' use of technology, proxied by nonbanks' demand for employees with technology-related skills, indeed increases. Furthermore, we find that complaints against nonbanks about issues related to the payment process—complaints that are likely resolved by upgrading technologies deployed in online payment platforms—are significantly reduced as nonbanks' market share increases. Collectively, the evidence suggests that nonbanks invest more in technology to improve their quality of mortgage servicing as their market share increases.

The rest of the paper proceeds as follows. Section 2 discusses related literature. Section 3 describes the data and sample. In Section 4, we examine the effect of nonbank market share on the quality of nonbanks' post-origination mortgage servicing. In Section 5, we explore potential explanations for the reduction in nonbanks' servicing-related compliant ratio as their market share increases. Section 6 concludes.

[3]Our interpretation should not be severely biased by the lower financial literacy of lower-income borrowers. We have shown that borrowers of nonbanks are not less likely to complain than borrowers of traditional banks, although the average income of nonbanks' borrowers is lower than that of traditional banks' borrowers. Also, prior literature shows that there are more mortgage-related complaints in areas with a higher proportion of poor populations (Begley and Purnanandam 2021).

2 Related Literature

Nonbanks, i.e., financial intermediaries that provide banking services but do not rely on deposits as a funding source, have experienced marked growth, especially in the residential mortgage market, since the recovery from the GFC. The consequences of this expansion have been of great interest to regulators and policymakers. So far, the literature documents both positive and negative effects of a growing nonbank industry. Regarding the positive effects, the literature shows that nonbanks play an important role in supplying credit, especially when credit supply by traditional deposit-taking banks is constrained. For example, Buchak et al. (2018) and Irani et al. (2021) show that, in response to the increased regulatory burdens, such as higher capital requirements, banks are likely to reduce credit supply while nonbanks are likely to fill in the gaps. By examining small business loans, Gopal and Schnabl (2022) show that lending by nonbanks substitutes for the reduction in lending by banks after the GFC. The literature also shows that nonbanks provide credit access for borrowers with lower credit quality (Buchak et al. 2018; Gete and Reher 2021; Jagtiani et al. 2021). Regarding the negative effects, theory suggests that nonbanks may impose significant fragility on the financial system because they lack insured liabilities in their funding structure (e.g., Plantin 2015). Empirically, Irani et al. (2021) show that, during the GFC, loans originated by nonbanks with relatively liquid liabilities were less likely to be rolled over and those loans also experienced greater price volatility. Our study contributes to this strand of literature by exploring a different dimension—the quality of financial services received by mortgage borrowers—to assess the consequences of the nonbank industry's expansion.

To understand the consequences of nonbanks' presence, a collection of studies examine the extent to which nonbanks improve or impair the overall efficiency of the financial system (Philippon 2016). For example, focusing on the role of Fintech lenders in the Paycheck Protection Program (PPP) during the Covid-19 pandemic, the literature documents both positive and negative effects of Fintech lenders on allocating credit. On the one hand,

Erel and Liebersohn (2022) show that Fintech complements banks during the pandemic by expanding financial services to ZIP codes where traditional banks do not have a strong presence. On the other hand, Griffin et al. (2023) show that misreporting is higher among FinTech loans than other loans in the PPP program. Furthermore, in the mortgage market, Gete and Reher (2021) show that nonbanks increase ZIP code-level home ownership, suggesting that nonbanks complement traditional banks by serving low credit quality borrowers. Our findings suggest that one channel through which nonbanks could improve the efficiency in the mortgage market is to improve service quality by developing expertise in servicing lower-income borrowers. This evidence is consistent with the market trend of the mortgage servicing industry, which indicates that nonbanks have increasingly focused on acquiring specialty and delinquent servicing (Hernandez et al. 2015).

Another strand of literature that provides important guidance to our research agenda and the interpretation of results is the literature on scale economies in the financial sector. The existing literature supports the notion that the banking industry significantly benefits from scale economies (Hughes and Mester 2013). The benefits have become even more salient in recent years because of the high costs associated with adopting advanced technology in the banking industry, such as computing, telecommunication, automation, machine learning, and artificial intelligence (Mester 2010). In recent years, the U.S. banking industry has spent over $100 billion annually on technology investment.[4] Fuster et al. (2019) show that advanced technology plays an important role in improving the operational efficiency of mortgage lenders. Our study provides evidence consistent with the notion that a large market share allows nonbanks to take advantage of scale economies in funding and utilizing advanced technology, reducing the likelihood of consumer complaints.

Our study is closely related to the recent literature that goes beyond the quantitative measure of financial services and focuses on the quality of financial services. Using the CFPB data, Sedunov (2020) shows that consumer satisfaction is higher in counties with more small

[4]Please see https://www.wsj.com/articles/technology-is-banks-new-battleground-11568114378.

banks; Begley and Purnanandam (2021) show that mortgage-related complaints are higher in areas with a higher proportion of poor and minority borrowers and in areas targeted by the CRA. Using fraud conducted by financial advisers, Gurun et al. (2018) show that trust plays a critical role in the investment advisory industry; Egan et al. (2019) show that misconduct among financial advisers is extensive in the United States and unsophisticated consumers are the targets. Focusing on an important trend in the consumer lending market—the rise of nonbanks, we provide evidence that the expansion of nonbanks' market share has a positive effect on the service quality received by consumers in the mortgage market.

Our findings also provide new evidence on the interplay between the quantity and quality of financial services using the nonbank industry as a laboratory. Closely related to our paper is Begley and Purnanandam (2021). Focusing on the Community Reinvestment Act (CRA), they show that when banks increase the quantity of mortgage supply due to regulatory requirements, their service quality (proxied by consumer complaints) declines. Their finding suggests that banks trade off the quantity of credit supply for the quality of such services. In contrast, our evidence suggests that when the mortgage supply increases due to market forces, financial institutions are able to develop relevant expertise and upscale investment, resulting in improved service quality. This contrasting evidence together is policy-relevant because, at the time of writing, policymakers are considering overhauling the CRA to encompass nonbanks.[5]

3 Data and sample

3.1 Data

We obtain mortgage-related complaints from the CFPB. After the GFC, the DFA established the CFPB as a platform for consumers to file complaints against financial institutions

[5]For example, please see https://www.wsj.com/articles/powell-highlights-slower-recovery-for-low-wage-and-minority-workers-11620065926.

with regard to a wide range of financial products, such as credit reports, debt collection, student loans, and mortgages. The CFPB has considerable authority to conduct investigations of the complaints. The resulting gathered facts are used to identify violations of federal consumer financial law and may be used in a public enforcement action. Since its inception until 2020, the CFPB has received over 1.5 million consumer complaints and provided over $13 billion in consumer relief.

Among the complaints filed with the CFPB, 17% are related to mortgages. The majority of these complaints concern post-origination mortgage servicing (such as payment processing, loan modification, loan collection, and foreclosure) rather than mortgage origination. For most complaints, the CFPB reports the five-digit ZIP code of the filing consumer. For some complaints, the CFPB also includes a brief narrative of the complaint; in these cases, the last two digits of the ZIP code are removed to protect the consumer's anonymity. We restrict our analysis to only complaints with five-digit ZIP codes reported in the CFPB, to accurately match complaints in a county with the market share of nonbanks in the county.

Information on mortgage loans comes from the HMDA dataset, which provides substantial coverage of the U.S. residential mortgage market.[6] The HMDA data contain detailed information on loan applications and origination, including the application year, application outcome, loan amount, loan type, loan purpose, the location of the mortgaged property, the income and demographic information of applicants, and lender identity. We classify HMDA lenders into traditional deposit-taking banks and nonbanks by using the Avery file, following Jagtiani et al. (2021).

To construct our sample, following Loutskina and Strahan (2009), we keep only conventional home purchase loans originated for owner-occupied 1-to-4 family housings;[7] we drop loans with missing information on loan size, applicant income, or location. We also drop loans smaller than $10 thousand or larger than $10 million. We exclude mortgages insured

[6]Avery et al. (2007) estimate that the coverage is about 80% in 2006.

[7]If we include all mortgages (including refinancing loans, loans for houses that are non-owner occupied, and loans for multi-family houses) in the sample, our main results remain robust.

by the Federal Housing Administration (FHA) and mortgages guaranteed by the U.S. Department of Veterans Affairs (VA). This empirical choice is due to two reasons. First, FHA and VA loans are different from other mortgages in that they are issued to lower credit quality borrowers with explicit guarantee/insurance provided by government agencies; these differences per se are likely to lead to different service outcomes for FHA and VA loans compared with those for other mortgages.[8] Second, nonbanks are the dominant mortgage originators for these loans during our sample period, reaching 80% by 2016 (Jagtiani et al., 2021); by comparison, in the conventional mortgage loan market, nonbanks originated 45% of the mortgages in 2016. Therefore, mixing the FHA and VA loan market with the conventional mortgage loan market would complicate the interpretation of the results about mortgage service quality. Nonetheless, we include FHA and VA loans in a robustness test.[9]

Regarding other data used in our analyses, we obtain county-level income per capita from the Bureau of Economic Analysis (BEA), and county-level unemployment rates from the Bureau of Labor Statistics (BLS).

3.2 Sample and main variables

We start with mortgage-related complaints filed against nonbanks between 2012 and 2018.[10] Table 1 shows the distribution of issues associated with these complaints. We differentiate between complaints about the post-origination mortgage servicing and complaints about mortgage origination. Complaints about the post-origination mortgage servicing include complaints tagged by the CFPB under the following five categories: "Loan modification, collection, foreclosure," "Loan servicing, payments, escrow account," "Settlement process and costs," "Struggling to pay mortgage," and "Trouble during payment process." Complaints about mortgage origination include complaints tagged by the CFPB under the

[8]Confirming this conjecture, we find that although FHA and VA loans comprise 25% of the overall mortgage market in 2016, there are only 12.6% of the complaints filed against FHA or VA loans in 2016 in the CFPB database.

[9]Please see 4.1 for details.

[10]Our sample period starts in 2012 because it is the first year with full-year coverage in the CFPB dataset.

following four categories: "Application, originator, mortgage broker," "Applying for a mortgage or refinancing an existing mortgage," "Credit decision / Underwriting," and "Closing on a mortgage." The top four issues in the sample are all related to post-origination mortgage servicing. Less than 10% of the complaints are related to mortgage origination.

Our measure of nonbanks' quality of post-origination servicing is the county-year nonbank servicing-related complaint ratio, which is defined as the number of complaints filed against nonbanks with issues related to post-origination servicing scaled by the number of outstanding mortgages originated by nonbanks. The scaling variable is the number of outstanding loans in a year rather than the number of loans originated in that year because many complaints are associated with the servicing of mortgages that may be originated in previous years. Since there is no data sources that report the number of outstanding mortgage loans by nonbanks in a county, we proxy it using the total number of mortgages originated in that county by nonbanks during the last five years.

For a county to be included in our sample, we require the median number of mortgage complaints in the county during our sample period to be at least one; as a result, our sample for the county-level analyses includes 7,178 county-year observations.[11] Table 2 shows that an average county-year reports about 6 complaints out of 2,296 outstanding mortgage loans originated by nonbanks, resulting in a servicing-related complaint ratio of 0.43%. We observe a large cross-sectional variation in complaint ratios with an interquartile range of 0.46%.

Nonbanks' market share for a county-year is calculated as the dollar amount of mortgages originated in the county in year *t-1* by nonbanks over the dollar amount of mortgages originated in the county in year *t-1* by all lenders. Figure 1 shows that there is a secular increase in the market share of nonbanks in the mortgage market after the GFC. The average market share of nonbanks in our sample is 32% with an interquartile range from 20% to 43%.

It is important to note that our measure of nonbanks' market share is based on infor-

[11] Our results are robust to (1) requiring the median number of complaints in the county during our sample period to be more than one, or (2) including all counties with at least one complaint during the sample period.

mation about mortgage origination. In interpreting our results, we use nonbanks' market share of mortgage origination as a proxy for nonbanks' overall market share of the mortgage industry, including both origination and post-origination servicing. This empirical choice is due to two considerations. First, comprehensive data on mortgage services are not available, making it impossible to conduct empirical analysis using granular observations.

Second and more importantly, based on several samples, nonbanks' market share of mortgage origination and that of post-origination servicing in the local mortgage market are highly correlated, making the use of origination information appropriate in measuring nonbanks' overall presence in the mortgage market. For example, using a sample of mortgages sold to Freddie Mac and still outstanding during our sample period (i.e., 2012–2018), the top left panel of Figure 2 shows the relationship between nonbanks' nationwide market share of mortgage origination and that of post-origination servicing. The correlation between the two series is 0.99.[12,13] The remaining panels of Figure 2 provide bin scatter plots, which show the relationship between nonbanks' market share of mortgage origination and that of post-origination servicing at various geographical levels. Specifically, we group nonbanks' market shares of mortgage origination into 10 bins for the state-level panel and 100 bins for the Metropolitan statistical areas (MSA) level and ZIP-code level panels; we plot the average nonbank market share of mortgage origination and that of post-origination servicing for each bin. Across all three panels, we see a close alignment of nonbanks' market shares of these two businesses. Therefore, although nonbanks mostly use the originate-to-distribute model of lending, they often time remain the servicing entity for a sizable portion of the loans they sell.

Furthermore, during our sample period, traditional banks were limited in their ability to purchase mortgage servicing rights from nonbanks due to the Basel III capital requirements

[12]This sample is from Freddie Mac Single Family Loan-Level Dataset. The dataset reports the sellers of mortgages and we assume these sellers as the originators of the mortgages.

[13]We also use a sample of mortgage lenders that are included in both the HMDA and eMBS datasets between 2016 and 2018, and we find similar results; nationwide, the correlation between nonbanks' market share of mortgage origination and that of post-origination servicing is 0.99. We thank You Suk Kim for providing this matched sample.

(Lux and Greene 2015). Therefore, in our sample, mortgages that are originated by nonbanks are likely serviced by nonbanks. Because the interpretation of our findings is based on the market share of all nonbanks in a county, rather than the market share of individual nonbanks in the county, the transfer of mortgage servicing rights between nonbanks should not impact our interpretation.

4 Nonbanks' market share and the quality of their mortgage servicing

The goal of our empirical analysis is to understand the effects of nonbanks' market share in a county on the quality of mortgage servicing by nonbanks in the county. In this section, we provide evidence that nonbanks' market share in a county is negatively associated with nonbanks' servicing-related complaint ratio in the county. We conduct two instrumental variable analyses to support a causal link between the increase in nonbanks' market share and the decrease in nonbanks' mortgage servicing-related complaint ratio.

4.1 Ordinary least squares (OLS) regression

We start our analysis by estimating the following regression model as the baseline specification:

$$Nonbank\,complaint\,ratio_{c,t} = \beta Nonbank\,share_{c,t-1} + \gamma Controls_{c,t-1} + \delta_c + \eta_t + \epsilon_{c,t}, \quad (1)$$

where the dependent variable is the county-level nonbanks' servicing-related complaint ratio, which is the total number of complaints against nonbanks with issues related to post-origination servicing in county c in year t scaled by the number of outstanding mortgage loans held by nonbanks in the county in that year. $Nonbank\,share_{c,t-1}$ is the market share of nonbanks in the county's residential mortgage market in year t-1. We focus on nonbank

market share in the preceding year because we are interested in the effect of the most recent nonbank market share on the complaint ratio. Although some complaints could be against mortgages originated years ago, we are interested in the impact of the most recent market share of nonbanks on servicing quality, not the impact of nonbanks' market share many years ago. $Controls_{c,t-1}$ includes county income per capita and unemployment rates to absorb time-varying differences in economic conditions across counties. δ_c indicates county fixed effects and controls for the unobserved time-invariant differences across counties. η_t indicates year fixed effects and controls for the time trend of complaint ratios and macro-level shocks that may affect the complaint ratio. Standard errors are clustered at the county level.

Table 3 presents the baseline estimation results. Columns (1) and (2) show that as nonbanks take a larger market share in a county, their servicing-related complaint ratio in the county decreases. The effect is economically meaningful—with all control variables, column (2) shows that a one standard deviation increase in nonbanks' market share is associated with a 0.084 percentage point reduction in nonbanks' servicing-related complaint ratio. This magnitude of reduction is economically meaningful as it represents 20% of the average county-level servicing-related complaint ratio for nonbanks.[14] In column (3), we examine complaints with issues related to mortgage origination. The result shows that there is no significant association between nonbanks' market share and complaints about nonbanks' mortgage origination. This result may not be surprising since the majority of the mortgage-related complaints filed with the CFPB are about post-origination mortgage servicing. Nonetheless, this finding highlights an important distinction between our study and the existing studies that focus on the origination stage of mortgages to understand the impact of nonbanks on the mortgage market.

One might wonder if these results are due to the transfer of mortgage servicing rights from nonbanks to traditional banks. Although the information on the transfer of mortgage

[14]The average county-level servicing-related complaint ratio for nonbanks is 0.43%.

servicing rights is not available to us, we do not believe that such transfer is driving our results. As discussed in 3.2, during our sample period, mortgages that are originated by nonbanks are likely serviced by nonbanks because traditional banks are not likely to buy mortgage servicing rights from nonbanks due to the Basel III capital requirements (Lux and Greene 2015). By contrast, nonbanks, which do not face the same regulations, are more likely to purchase mortgage servicing rights from traditional banks, especially the mortgage servicing rights of lower-quality loans. Therefore, our results, if anything, may underestimate the extent to which the complaint ratio of nonbanks reduces during our sample period.

We conduct a battery of robustness tests and the results are reported in Table A1. In column (1), we include FHA and VA loans in the sample. In column (2), we drop observations from 2012 to limit the impact of GFC on the result. To examine whether the results are driven by large nonbanks, we exclude Quicken Loans (i.e., the nonbank with the largest amount of loan origination in our sample) and the top three nonbanks in columns (3) and (4), respectively. The negative association between nonbanks' servicing-related complaint ratio and nonbanks' market share survive all the robustness tests.

4.2 Instrumental variable analyses

Nonbanks' presence in a county is not random. Besides time-invariant county characteristics, time-varying county characteristics and local economic dynamics may affect nonbanks' decisions to expand in specific counties. Therefore, although we include county fixed effects in the OLS regression, the presence of unobserved time-varying county characteristics may be correlated with both the market share of nonbanks in the county and nonbanks' servicing-related complaint ratio in the county, resulting in biased estimates. To address this identification challenge, we conduct two instrumental variable (IV) analyses.

4.2.1 Instrumental variable analysis: stress tests

The first IV analysis exploits the stress tests implemented by the Federal Reserve. The DFA requires Federal Reserve to conduct annual stress tests starting from 2009 to assess if large bank holding companies have sufficient capital to absorb losses under several stress scenarios. Covas (2017) shows that stress tests impose disproportionately high capital requirements on residential mortgages. Buchak et al. (2018) suggest that banks reduce mortgage lending in order to build capital buffers required by regulations, facilitating the expansion of nonbanks' market share.[15] Therefore, nonbanks' market share is likely to increase more aggressively in counties with a higher ex ante exposure to stress-tested banks, *ceteris paribus*.

For this IV analysis, we use counties' ex ante exposure to stress-tested banks as an instrument for the change in nonbanks' market shares in the local residential mortgage market. Specifically, we calculate the IV as the county's mortgage market share in 2008 (i.e., the year right before the inception of stress tests) held by banks that would be subject to stress tests during our sample period.[16] This IV analysis examines whether the instrumented within-county change in nonbanks' market shares between 2012 and 2018 affects the within-county change in the servicing-related complaint ratio during the same period.

Although nonbanks are not subject to stress tests, we acknowledge that stress tests may affect the quality of mortgage servicing by nonbanks in the local mortgage market through peer effects or market competition. However, this consideration should not result in a violation of the exclusion restriction in our empirical setup because our sample period starts in 2012, which is years after the inception of stress tests (i.e., 2009).[17] During our sample period, the impact of stress tests is likely already incorporated in the observed level of servicing quality. Therefore, although the county's ex ante exposure to stress-tested banks may affect the quality of mortgage servicing by nonbanks soon after the inception of stress

[15] Please also see Irani et al. (2021), Chernenko et al. (2022), and Begley and Srinivasan (2022).

[16] This IV approach is similar to the one used in Begley and Srinivasan (2022).

[17] Prior to the passage of DFA in 2010, the Federal Reserve initiated the Supervisory Capital Assessment Program (SCAP) in 2009 to conduct stress tests on large U.S. bank holding companies.

tests, it should not influence the within-county changes in nonbanks' quality of mortgage servicing years after the inception of stress tests through channels other than its impact on the growth of nonbanks in the county. In addition, we conduct two robustness tests of this IV strategy to ensure our interpretation is not contaminated by the direct impact of stress tests on servicing quality provided by nonbanks. The details of these robustness tests are discussed at the end of this subsection.

We estimate the following regression model:

$$Nonbank\,complaint\,ratio_{c,\Delta(2018-2012)} = \beta Nonbank\,share_{c,\Delta(2017-2011)} + \gamma Controls_{c,\Delta(2017-2011)} + \epsilon_c, \tag{2}$$

where $c, \Delta(2017-2011)$ indicates the within-county change in variables from 2011 to 2017, and $Nonbank\,share_{c,\Delta(2017-2011)}$ is instrumented by counties' ex ante exposure to banks subject to stress tests.

Table 4 presents the regression results. The result from the first-stage regression (column 1) shows that counties with a higher ex ante exposure to stress-tested banks indeed experience higher growth in nonbanks' market share. Consequently, the result from the second-stage regression (column 2) shows that these counties witness a larger reduction in nonbanks' servicing-related complaint ratio. Regarding the size of the coefficients, the IV estimates suggest a much larger effect of nonbanks' market share on the complaint ratio than the OLS estimates.

To strengthen our identifying assumption and ensure that our IV results are not due to the direct impact of stress tests on nonbanks' servicing quality, we conduct two robustness tests. First, we focus on a more recent change in complaint ratios (i.e., changes between 2014 and 2018). Considering that any possible direct effects of stress tests on the quality of mortgage servicing may take time to appear, the changes in complaint ratios during the early years of the stress tests may be partially due to stress tests directly. However, this is less likely to be a concern if we focus on changes in complaint ratios during the later years

of our sample period. The results reported in columns (3) and (4) of Table 4 show that our findings remain robust when we focus on this more recent change in complaint ratios.

Second, we limit our sample to counties, whose ex ante exposure to stress-tested banks is not influenced by the inclusion of more banks in the stress tests in the later years of our sample period. Because the number of stress-tested banks increased significantly in 2014,[18] some counties' exposure to stress-tested banks experienced a large increase after 2013, which may affect the quality of mortgage servicing in these counties and hence the within-county change in nonbanks' complaint ratios. This should not be a concern if we exclude counties with ex ante exposure to banks that have only become a participant in stress tests after 2013. The results reported in columns (5) and (6) of Table 4 show that our findings remain robust when we exclude this subsample of counties.

4.2.2 Instrumental variable analysis: mortgage industry surety bonds

The second IV analysis exploits the variation in mortgage industry surety bonds required by each state. These requirements are imposed in order to protect mortgage borrowers against dishonest lending practices. To conduct mortgage business in a state, mortgage professionals, such as mortgage brokers, lenders, originators, and servicers, need to apply for licenses from the state and are required to abide by all state laws and regulations. In particular, as part of the licensing application, mortgage professionals (i.e., the principals) are required to post surety bonds through a surety bond company. In case of noncompliance (such as predatory lending behavior), surety bond company will promptly pay for all costs and damages and then seek full compensation, including expenses, from the principals. The annual premium charged by the surety bond company is determined by the amount of surety bond required, the expected value of claims against the principal, and the probability of collecting full compensation from the principal. As a result, before issuing the bond, the surety bond company may conduct detailed screening of the bond applicants, making surety

[18] Pre-2014, stress tests on average include 19 BHCs; since 2014, stress tests on average include more than 30 BHCs.

bond a significant barrier to entry in states with a high amount of surety bond requirement, especially for entities with few years in the business (Kleiner and Todd (2009). Therefore, the amount of surety bond required in a state reflects the costs of conducting mortgage business in the state and the difficulties in entering the mortgage market of the state. This implies that nonbanks should expand more aggressively in states with lower surety bond requirements, *ceteris paribus* (the relevance condition).

For this IV analysis, we use states' minimum amount of surety bond imposed on mortgage brokers as an instrument for the change in nonbanks' market shares in the local residential mortgage market.[19] Same as the first IV strategy, this IV analysis examines whether the instrumented within-county change in nonbanks' market shares between 2012 and 2018 affects the within-county change in nonbanks' servicing-related complaint ratios during the same period. One might argue that the level of surety bond requirement of a state may reflect the overall toughness of the state's mortgage regulations, which might have a direct effect on the quality of mortgage servicing in the state. However, surety bond requirements should not affect the within-county changes in nonbanks' servicing quality as long as there are no changes in these regulations over time (the exclusion condition). Therefore, for this IV analysis, we restrict our sample to states that have not experienced any changes in the amount of bond required since 2010.[20]

We re-estimate equation (2) but use the log amount of the mortgage broker surety bond required by each state to instrument for $Nonbank_{c,\Delta(2017-2011)}$. Table 5 presents the regression results. Column (1) reports the result from the first-stage regression. It shows that counties that reside in states with a lower amount of surety bond requirement experience higher growth in nonbanks' market share. These counties, as shown in the results from

[19]Surety bonds imposed on mortgage brokers are the most prevalent across states compared to those imposed on other mortgage professionals; such information, therefore, provides a clear comparison of the costs of conducting mortgage business across states. Typically, the amount of surety bond imposed on mortgage lenders and servicers is usually the same as that imposed on mortgage brokers.

[20]To identify states with no changes in surety bond requirement for mortgage brokers during our sample period, we collect each state's mortgage broker surety bond requirement at the time of writing (i.e, September 2021) and compare it with the mortgage broker surety bond requirement as of 2010 available here.

the second stage regression reported in column (2), witness a larger reduction in nonbanks' servicing-related complaint ratio subsequently.[21]

This second IV also helps us to address one potential endogeneity concern present in the first IV. It is possible that a county's characteristics may determine its ex ante exposure to stress tested banks. If these county characteristics are also correlated with the *changes* in nonbank market share and their servicing-related complaint ratio, the coefficient estimate of the first IV analysis may be biased. A similar concern is less likely to exist for the second IV because the characteristics of a single county should not determine the surety bond requirement of the entire state. Nonetheless, we strengthen this identifying assumption by conducting a robustness test, where we limit our investigation to counties that are not likely to influence state-level mortgage regulations. Arguably, large counties in a state carry a greater weight in influencing the state's regulation. If so, the characteristics of these large counties may be correlated with the state's surety bond requirement. Therefore, in the robustness test, we repeat the surety bond IV analysis but exclude large counties in the state, i.e., counties with a population in the top decile or quintile within each state. The results are reported in columns (3)-(6) of Table 5 and our finding remains robust.

5 Potential explanations for the improved servicing quality by nonbanks

In this section, we explore the explanations for the improved quality of post-origination mortgage serving by nonbanks accompanying their rise in the local residential mortgage market. The first explanation that we explore is lender specialization. For example, in the market of business loans, some private equity/debt funds specialize in holding special situation loans, such as distressed loans, and these funds possess expertise in helping businesses restructure to avoid bankruptcy (DePonte 2010). Similarly, if nonbank mortgage lenders

[21] The results in this table are robust to clustering standard errors at the state level.

develop a specialty in servicing lower-income borrowers as their market share increases, such specialization may lead to higher-quality mortgage servicing by allowing nonbanks to develop a deeper understanding of their customers' needs and to be better equipped to solve their customers' issues (Hernandez et al. 2015). The second explanation that we explore is nonbanks' investment in technology. Fuster et al. (2019) show that the adoption of technology play an important role in improving the efficiency of the U.S. mortgage market. If nonbanks make such investments as their market share grows, complaints against nonbanks may decrease as a result.

5.1 Lender specialization

Regarding the first explanation, we start by exploring the borrower profiles of nonbanks and estimate the following regression:

$$Outcome_{c,t} = \beta Nonbank\ share_{c,t-1} + \delta_c + \eta_t + \epsilon_{c,t}, \tag{3}$$

where $Outcome_{c,t}$ is either the average income of nonbanks' borrowers in a county-year or the income dispersion of these borrowers (i.e., the interquartile range of borrower incomes scaled by the average income). $Nonbank_{c,t-1}$ is the lagged market share of nonbanks in the county's residential mortgage market. δ_c indicates county fixed effects and η_t indicates year fixed effects.

Column (1) of Table 6 reports the results for the average income. We find a negative and significant coefficient on $Nonbank\ share_{c,t-1}$, indicating that as nonbanks' market share increases in the local mortgage market, the average income of their borrower base decreases. Column (2) shows the result for the income dispersion. We find a lower income dispersion as nonbanks' market share increases. Taken together, the evidence suggests that nonbanks become increasingly focused on lower-income borrowers as nonbanks' market share grows. Prior literature documents that the average borrower income of nonbanks is lower than that

of traditional banks (Buchak et al. 2018). Our evidence is different from this literature in that our evidence is not about the difference between the average borrower income of nonbanks and that of banks. Instead, we show that nonbanks' customers become more concentrated among lower-income borrowers as nonbanks' market share increases.

Throughout our paper, we interpret the decreased servicing-related complaint ratio as evidence of improved quality of post-origination mortgage servicing. One might argue that lower-income borrowers may be of a lower level of financial literacy so they do not know that they can complain to the CFPB or how to do so. We do not believe that this possibility could bias our results and interpretation in a meaningful way because previous literature shows that there are more mortgage-related complaints in areas with a higher proportion of poor populations (Begley and Purnanandam 2021). Importantly, considering poorer populations' higher likelihood to complain documented in the literature, the reduction in average borrower income as nonbanks increase their market share provide further support to our interpretation—as nonbanks' market share increases, their quality of post-origination mortgage servicing improves.

If nonbanks increasingly focus on lower-income borrowers, is there a spillover effect that impact the borrower income profile of traditional banks and ultimately these banks' complaint ratio? Columns (3) and (4) of Table 6 show the association between traditional banks' borrower income profile and nonbank market share in the county. We find that as nonbanks' market share increases in the local mortgage market, the average income of traditional banks' borrowers increases albeit the income dispersion does not change.

Next, we regress the servicing-related complaint ratio of traditional banks on nonbanks' market share. The servicing-related complaint ratio of traditional banks is calculated as the number of mortgage complaints regarding servicing issues against traditional banks divided by the number of outstanding loans originated by traditional banks; the denominator is proxied by the total number of mortgages originated by traditional banks in that county during the last five years. The results are reported in Table 7. In column (1), we find that

the servicing-related complaint ratio of traditional banks decreases as nonbanks account for a larger market share. Column (2) shows that this result holds using the stress test IV strategy described in Section 4.2. In column (3), we restrict our sample for the IV analysis to only traditional banks that have never undertaken a stress test and our finding remains robust. Column (4) shows that the result also holds when we use the surety bond IV strategy described in Section 4.2. This result is consistent with Begley and Purnanandam (2021), who show that, on average, higher-income borrowers receive higher-quality mortgage services, hence are less likely to file complaints against their lenders.

Since the complaint ratios of nonbanks and traditional banks both decrease as nonbank market share increases, the overall complaint ratio in the county should decrease as well. We confirm this conjecture in columns (5)-(7) of Table 7. The increased average income of banks' borrowers and the decreased average income of nonbanks' borrowers (reported in Table 6) together suggest that nonbanks and banks become increasingly specialized in different types of borrowers as nonbanks grow in size, leading to an overall improvement in the quality of post-origination mortgage servicing in the county.

Critical to the lender specialization explanation is whether nonbanks indeed become better at servicing lower-income borrowers. To shed light on this question, we take a close look at the specific issues of the complaints. Specially, we examine complaints about "Loan modification, collection, foreclosure" and "Struggling to pay mortgage," both of which are related to situations in which borrowers may have financial difficulties in making mortgage payments. In particular, borrowers may not have the financial resources to make mortgage payments based on the original mortgage terms. If nonbanks become more experienced in providing mortgage services to lower-income borrowers, complaints regarding these two issues should be reduced. Column (1) in Table 8 reports evidence supportive of this mechanism. It shows that as nonbanks' market share increases, complaints that are more likely filed by borrowers who lack financial resources are significantly reduced.

Collectively, our evidence suggests that as nonbanks' market share increases, they develop

a specialty in servicing lower-income borrowers, hence improving their mortgage servicing quality towards these borrowers. This finding is consistent with the discussion in Hernandez et al. (2015) and Lux and Greene (2015). According to Hernandez et al. (2015), specialization allows mortgage servicers to more efficiently manage loss mitigation efforts, foreclosure and bankruptcy activities; according to Lux and Greene (2015), specialization provides nonbanks with cost advantage in servicing nonperforming loans.

5.2 Investment in technology

Regarding the second explanation, we start by examining whether nonbanks' have enhanced incentives to invest in technology as their market share in the county increases. Nonbanks may have heightened incentives to invest if they can take advantage of the economies of scale because the marginal costs of technology investment are decreasing. Therefore, we propose that nonbanks in a local mortgage market should be more motivated to invest in technology if their market shares increase not only in the focal county but also in the entire nation.

We estimate the following two-stage regression:

$$\begin{aligned} Incentives_{Nonbanks,c,t} &= \beta_0 Nonbank\, share_{c,t} + \gamma Controls_{c,t} + \delta_c + \eta_t + \epsilon_{c,t} \;\; (1^{st} stage) \\ Complaint\, ratio_{c,t} &= \beta_1 \widehat{Incentives}_{Nonbanks,c,t-1} + \gamma Controls_{c,t-1} + \delta_c + \eta_t + \epsilon_{c,t} \;\; (2^{nd} stage). \end{aligned} \tag{4}$$

$Incentives_{Nonbanks,c,t}$ is measured by the market share in the nation held by all the nonbanks that originate loans in the county. The national market share is calculated as the dollar amount of mortgages originated by the nonbanks in year *t-1* scaled by the total dollar amount of mortgages originated in the nation in year *t-1*. This variable captures whether nonbanks in the local market increase their presence at the national level while increasing their market share in the focal county, allowing them to take advantage of the economies of scale in technology investment. $Controls_{c,t-1}$ includes county-year level income per capita

and unemployment rate. δ_c indicates county fixed effects and η_t indicates year fixed effects.

Table 9 reports the regression results. Column (1) reports the results for the first stage and shows that as nonbanks' market share increases in a county, these nonbanks' market share in the nation increases as well. In other words, the increased presence of nonbanks in a county is not due to a retraction of these nonbanks' market shares in other counties. The second stage result in column (2) suggests that the higher market share at the national level, predicted by the higher market share of nonbanks in the county, is associated with a lower servicing-related complaint ratio for nonbanks in the county. Column (3) shows that the result holds for complaints about post-origination mortgage servicing.

Do nonbanks indeed increase their investment in technology as their market share increases? Using job posting data from Burning Glass Technologies (BGT) during our sample period, we find evidence supportive of this notion. BGT collects the near-universe online job postings. A particularly useful feature of this data is that it compiles the skill requirements in the job postings. If nonbanks increase investments in technology, their demand for employees with technology-related skills should also increase. To examine whether this is the case, we aggregate the number of job postings in a county that require technology-related skills by nonbanks, and regress it on the market share of nonbanks in the county. We categorize a skill as a technology-related skill if it is tagged by the BGT as an information technology (IT) skill or a software skill. Table 10 reports the results. With different specifications, we consistently observe a positive and significant association between nonbanks' market share and their demand for technology-related skills. In terms of economic significance, column (4) indicates that a one standard deviation increase in nonbanks' market share in a county is associated with an increase in the number of nonbanks' job postings in the county that require technology-related skills by 13%. To assess whether the effect on skill requirements is due to a few large fintech lenders, In column (5), we exclude Quicken Loans and Guaranteed Rate Inc., two of the largest fintech nonbanks, and our result remains robust. This evidence suggests that nonbanks' use of technology increases as their market share increases,

potentially helping nonbanks provide higher-quality services to their mortgage customers.[22]

Finally, we examine the specific issues of the complaints against nonbanks. Among all the issues listed in Table 1, "Trouble during payment process" is most likely to benefit from investment in technology because this issue is likely resolved by improvements in nonbanks' infrastructure, such as upgrades of the technologies deployed in their online payment platforms. Therefore, if increased investment in technology can at least partially explain our finding, complaints regarding this issue should be reduced as nonbanks increase their market share. Column (2) of Table 8 reports evidence supportive of this mechanism. It shows that as nonbanks' market share increases, complaints that are more likely due to technical issues in the payment process are significantly reduced.

In addition, columns (3) and (4) of Table 8 show that as nonbanks' market share increases, complaints regarding post-origination mortgage servicing that are not related to the two identified mechanisms do not experience significant reductions.

6 Conclusion

In this paper, we study the impact of the rise of nonbanks on the quality of nonbanks' post-origination mortgage servicing in the residential mortgage market. The specific aspect of servicing quality that we focus on is the mortgage servicing-related complaints filed with the CFPB as a percentage of outstanding mortgages (i.e., the servicing-related complaint ratio). We find that as nonbanks increase their market share in a county, their servicing-related complaint ratio in the county decreases. To verify that the relation between nonbanks' market share and their servicing-related complaint ratio is indeed causal, we conduct two IV analyses. We instrument the change in nonbanks' market shares in a county using (1) the county's ex ante exposure to banks subject to Federal Reserve's stress tests, and (2) mortgage industry surety bonds required by the state. We find that the instrumented increase

[22]The positions advertised in these job postings are likely filled because the finance industry has one of the highest vacancy-employment conversion rates probably because wages in the finance industry are higher than those in the other industries (Abis and Veldkamp 2023).

in nonbanks' market share is associated with a reduction in nonbanks' servicing-related complaint ratio.

For this improvement in mortgage servicing quality, we provide evidence consistent with two explanations. First, as nonbanks increase their market share, they develop a specialty in servicing lower-income borrowers; meanwhile, traditional banks become increasingly specialized in higher-income borrowers and such lender specialization contributes to an overall reduction in servicing-related complaint ratio in the county. Second, as nonbanks increase their market share, they make more investments in technology.

As far as we are aware, our paper is the first to focus on the quality of post-origination mortgage servicing to understand the impact of nonbanks' expansion on mortgage borrowers. Focusing on financial products other than mortgages, such as cryptocurrencies and credit cards, existing studies show that nonbank financial companies, fintech companies in particular, may harm consumers (Calem 2022). We find that in the residential mortgage market, they are able to improve their post-origination mortgage servicing quality as they expand in this market. Our findings suggest that future policies and regulations of nonbanks should consider the effect of market shares on post-origination servicing quality. Our findings echo Philippon (2016) in that the non-traditional part of the financial sector has the potential to improve the efficiency of the financial system.

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Figure 1: Nonbanks' market share

This figure plots the median and inter-quartile range of the county-level nonbank market shares between 2008 and 2018. Nonbanks' market share for a county-year is calculated as the dollar amount of mortgages originated in the county-year by nonbanks over the dollar amount of mortgages originated in the county year by all lenders.

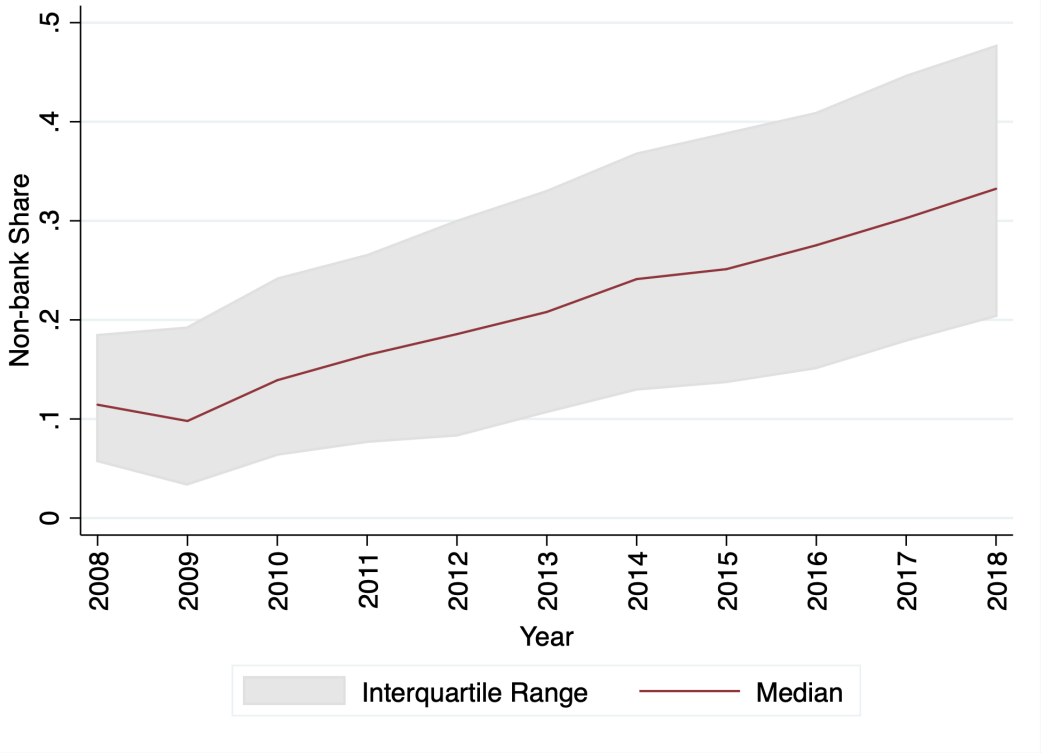

Figure 2: Nonbanks' market share: Origination vs. post-origination servicing

This figure plots the relationship between nonbanks' market share of mortgage origination and that of post-origination servicing at different geographical levels, using the sample of mortgages sold to Freddie Mac and still outstanding during our sample period (i.e., 2012–2018). The top left panel shows nonbanks' nationwide market shares, the top right panel shows nonbanks' state-level market shares, the bottom left panel shows nonbanks' MSA-level market shares, and the bottom right panel shows nonbanks' 3-digit ZIP code-level market shares. We group nonbanks' market shares of mortgage origination into 10 bins for the state-level panel and 100 bins for the MSA and ZIP-code level panels, and plot the average nonbank market share of mortgage origination and that of post-origination servicing for each bin. The market shares are trimmed at the 5% level.

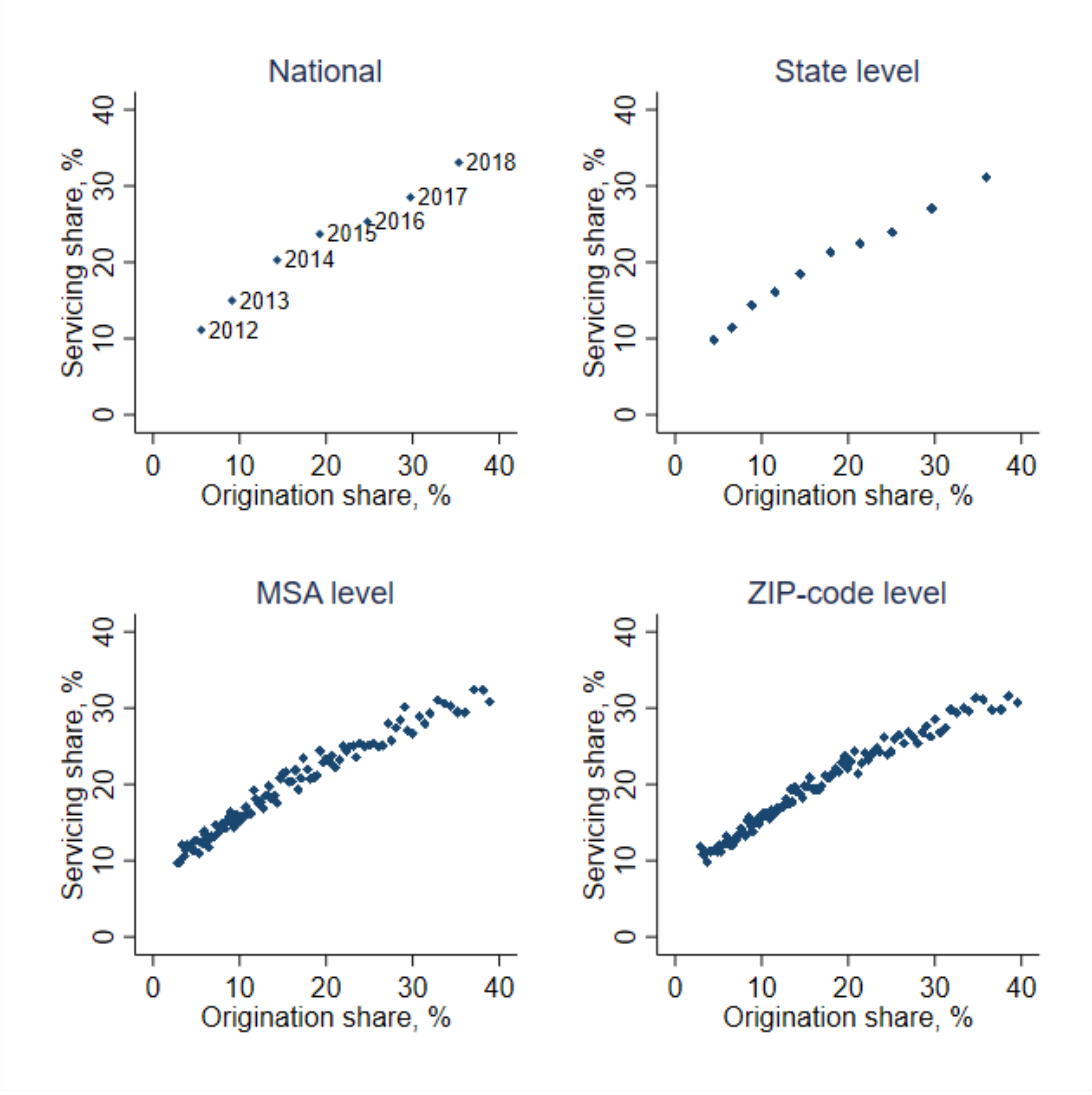

Table 1: Summary statistics: Complaints from the CFPB

This table reports the distribution of issues associated with the mortgage-related complaints filed against nonbanks.

Issue	Frequency	Percent (%)
Loan modification, collection, foreclosure	19,016	38.38
Loan servicing, payments, escrow account	16,722	33.75
Trouble during payment process	3,515	7.09
Struggling to pay mortgage	3,240	6.54
Application, originator, mortgage broker	2,402	4.85
Other	1,646	3.32
Settlement process and costs	1,295	2.61
Credit decision / Underwriting	648	1.31
Applying for a mortgage or refinancing an existing mortgage	502	1.01
Closing on a mortgage	369	0.74
Issues related to credit report	189	0.38
Total	49,544	

Table 2: Sample summary statistics

The sample that we use in our analysis is a product of matching county-level complaint data set from CFPB with county-level mortgage market data from HMDA, supplemented with county characteristics from BEA and BLS. This table reports the county-year-level summary statistics.

	Mean	SD	25^{th} perc.	Median	75^{th} perc.
Servicing-related complaint ratio (%)	0.43	1.46	0.00	0.14	0.46
# of servicing-related complaints	5.92	19.92	0.00	1.00	4.00
# of outstanding mortgages	2,296	5,746	174	512	1,906
Nonbank market share (%)	32.17	16.38	19.67	30.67	43.39
Income per capita (tho. $)	44.05	13.78	36.15	40.98	48.00
Unemployment rate (%)	5.91	2.26	4.32	5.50	7.05
Obs. (County × Year)	7,178				

Table 3: Nonbanks' market share and mortgage-related complaints against nonbanks

This table presents the OLS estimates from the regression of the county-level complaint ratio of nonbanks on nonbanks' market share in the county. The dependent variable is *Complaint ratio*, which is the number of mortgage-related complaints filed against nonbanks in a year scaled by the number of all mortgages originated by nonbanks in the previous five years. Columns (1) and (2) include complaints about post-origination mortgage servicing; column (3) includes complaints about mortgage origination. $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	Servicing-related complaints		Origination-related complaints
	(1)	(2)	(3)
Nonbank market share	-0.546**	-0.512**	0.006
	(0.261)	(0.257)	(0.062)
Log(Income per capita)		-0.383	-0.197**
		(0.411)	(0.096)
Unemployment rate		2.737*	0.086
		(1.450)	(0.312)
Year FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Observations	7,178	7,178	7,178
R-squared	0.436	0.437	0.291

Table 4: IV analysis using stress tests

This table presents county-level regression for change in nonbanks' servicing-related complaint ratios, using the county's ex ante exposure to stress tested banks as the instrument for change in nonbanks' market shares. The dependent variable in the first-stage regression is *Change in nonbank market shares* from 2011 to 2017 (from 2013 to 2017) in columns (1) and (5) (in column (3)). The dependent variable in the second-stage regressions is *Change in servicing-related complaint ratios* for nonbanks from 2012 to 2018 (from 2014 to 2018) in columns (2) and (6) (in column (4)). Columns (5) and (6) excludes counties that have ex ante exposure to banks that are newly added to the stress test list since 2014.*Servicing-related complaint ratio* is calculated as the number of post-origination mortgage servicing complaints filed against nonbanks in a year scaled by the number of all mortgages originated by nonbanks in the previous five years; *Stress test exposure* is the percentage of the county's mortgage market that is served by banks subject to stress tests right before the inception of stress tests. $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

	Baseline		Excluding initial ST years		Excluding new ST banks	
	First stage (1)	Second stage (2)	First stage (3)	Second stage (4)	First stage (5)	Second stage (6)
Stress test exposure	0.233***		0.136***		0.282***	
	(0.028)		(0.021)		(0.042)	
Δ*Nonbank market share*		-1.797***		-7.724***		-1.581*
		(0.542)		(2.002)		(0.858)
Δ*log(Income per capita)*	-0.194***	-0.230	-0.122**	-0.350	-0.149	0.290
	(0.057)	(0.262)	(0.053)	(0.675)	(0.093)	(0.564)
Δ*Unemployment rate*	-0.414**	-0.182	-0.129	7.640**	-0.028	0.291
	(0.210)	(1.041)	(0.229)	(2.988)	(0.310)	(1.800)
Observations	725	725	785	785	292	292
F-stat	70.64		41.40		45.46	

Table 5: IV analysis using mortgage industry surety bond requirements

This table presents county-level regression for change in nonbanks' servicing-related complaint ratios, using state-level mortgage broker bond requirement as the instrument for change in nonbanks' market shares. The dependent variable in the first-stage regression is *Change in nonbank market shares* from 2011 to 2017. The dependent variable in the second-stage regressions is *Change in servicing-related complaint ratios* for nonbanks from 2012 to 2018. Columns (3) and (4) excludes counties with a population in the top decile in the state, while columns (5) and (6) exclude those in the top quintile in the state. *Servicing-related complaint ratio* is calculated as the number of post-origination mortgage servicing complaints filed against nonbanks in a year scaled by the number of all mortgages originated by nonbanks in the previous five years. *Surety bond requirement* is the log of the dollar amount of mortgage broker bond required at the state (dollars in thousands). $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

	Baseline		Excluding large counties			
	First stage	Second stage	First stage	Second stage	First stage	Second stage
	(1)	(2)	(3)	(4)	(5)	(6)
Surety bond requirement	-0.012***		-0.011***		-0.010***	
	(0.003)		(0.003)		(0.004)	
Δ*Nonbank market share*		-2.793**		-2.635*		-3.173*
		(1.186)		(1.369)		(1.886)
Δ*log(Income per capita)*	-0.269***	-0.857	-0.247***	-0.705	-0.197**	-0.669
	(0.065)	(0.442)	(0.071)	(0.475)	(0.080)	(0.545)
Δ*Unemployment rate*	-0.792**	-1.484	-0.754***	-1.378	-0.614	-1.625
	(0.227)	(1.476)	(0.243)	(1.596)	(0.268)	(1.851)
Observations	550	550	494	494	418	418
F-stat	14.67		10.85		6.80	

Table 6: Borrower income profile

This table presents OLS estimates from the regression of borrower income on nonbanks' market share in the county. Columns (1) and (2) report the results for nonbanks; while columns (3) and (4) report the results for traditional banks. The dependent variable in columns (1) and (3) is *Average Income*; the dependent variable in columns (2) and (4) is *Income dispersion*, which is the interquartile range of borrower incomes scaled by *Average Income*. $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	Nonbanks		Traditional Banks	
	Average income	Income dispersion	Average income	Income dispersion
	(1)	(2)	(3)	(4)
Nonbank market share	-0.069*	-0.070**	0.089***	0.027
	(0.041)	(0.030)	(0.031)	(0.026)
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	7,185	7,185	7,397	7,397
R-squared	0.82	0.36	0.93	0.40

Table 7: Nonbanks' market share and mortgage-related complaints against traditional banks

This table presents the county-level regression results for the servicing-related complaint ratio of traditional banks (columns (1)-(4)) and that of all lenders (columns (5)-(7)). In the IV analyses, the dependent variable is *Change in servicing-related complaint ratios*; the independent variable is *Change in nonbanks' market shares* and is instrumented by the county's ex ante exposure to stress-tested banks (columns (2), (3) and (6)) and by the log of the dollar amount of mortgage industry bond required at the state (columns (4) and (7)). The sample in column (3) includes only banks that have never been stress tested. $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	Complaints against banks				Complaints against all lenders		
	OLS	Stress Test IV		Surety Bond IV	OLS	Stress Test IV	Surety Bond IV
		All Banks	Untested Banks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Nonbank market share	-0.282*				-0.309***		
	(0.150)				(0.103)		
Δ*Nonbank market share*		-1.848***	-0.342**	-2.591***		-2.135***	-2.822***
		(0.389)	(0.157)	(0.924)		(0.442)	(0.965)
log(Income per capita)	-0.240*				-0.291***		
	(0.125)				(0.111)		
Δ*log(Income per capita)*		-0.684***	-0.179**	-1.079***		-0.536***	-1.004***
		(0.188)	(0.076)	(0.344)		(0.205)	(0.360)
Unemployment rate	3.891***				3.033***		
	(0.579)				(0.512)		
Δ*Unemployment rate*		1.298*	-0.289	0.559		1.182*	0.439
		(0.746)	(0.301)	(1.149)		(0.681)	(1.201)
Year FE	Yes	No	No	No	Yes	No	No
County FE	Yes	No	No	No	Yes	No	No
Observations	7,178	725	725	550	7,178	725	550

Table 8: Detailed complaint issues against nonbanks

This table presents the OLS estimates from the regression of the county-level complaint ratio on nonbanks' market share in the county. The dependent variable is *Complaint ratio*, which is the number of mortgage-related complaints filed againtst nonbanks in a year scaled by the number of all mortgages originated by nonbanks in the previous five years. Column (1) includes complaints about "loan modification, collection, foreclosure" and "struggling to pay mortgage;" column (2) includes complaints about "trouble during payment process;" column (3) includes complaints about "loan servicing, payments, escrow account;" column (4) includes complaints about "settlement process and costs." $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	Payment Difficulty Complaints	Payment Processing Complaints	Escrow Account Complaints	Settlement Related Complaints
	(1)	(2)	(3)	(4)
Nonbank market share	-0.352*	-0.106**	-0.040	-0.013
	(0.212)	(0.046)	(0.124)	(0.029)
log(Income per capita)	-0.068	-0.188	-0.152	0.024
	(0.279)	(0.118)	(0.192)	(0.039)
Unemployment rate	1.958	-0.624**	1.161	0.242
	(1.215)	(0.246)	(0.710)	(0.218)
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	7,178	7,178	7,178	7,178
R-squared	0.398	0.403	0.370	0.301

Table 9: Nonbanks' national market share and mortgage-related complaints

This table presents the results from the regression of the servicing-related complaint ratio on the national market share of the nonbanks that originate loans in the county. The dependent variable in the first-stage regression is *National market share*, which is the summation of national market share of all nonbanks that originate loans in the county. Each nonbank's national market share is calculated as the amount of mortgages originated by the nonbank in the previous year scaled by the total amount of mortgages originated by all lenders in the nation in the previous year. The dependent variable in the second-stage regressions is *Servicing-related complaint ratio*, which is the number of post-origination mortgage servicing complaints filed against nonbanks in a year scaled by all mortgages originated by nonbanks in the previous five years. $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	First stage	Second stage
	(1)	(2)
Nonbank market share	0.100***	
	(0.008)	
National market share		-5.100**
		(2.565)
log(Income per capita)	0.120***	0.229
	(0.019)	(0.461)
Unemployment rate	-0.145**	1.997
	(0.057)	(1.477)
Year FE	Yes	Yes
County FE	Yes	Yes
Observations	7,178	7,178
F-stat	160.69	

Table 10: Nonbanks' demand for technology-related skills: Evidence from job posting data

This table presents the OLS estimates from the regression of the aggregate number of job postings that require technology-related skills by nonbanks in a county on nonbanks' market share in the county. The dependent variable is *log(1+number of job postings with technology-related skills)*, which is the log of the total number of job postings that require technology-related skills by nonbanks in a county-year. Column (5) excludes Quicken Loans and Guaranteed Rate Inc., two of the largest fintech nonbanks. $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	All nonbanks				Exclude top two fintech nonbanks
	(1)	(2)	(3)	(4)	(5)
Nonbank market share	1.889***	1.513***	0.813**	0.907**	1.133***
	(0.251)	(0.294)	(0.400)	(0.398)	(0.387)
log(Income per capita)				1.284**	1.264**
				(0.505)	(0.504)
Year FE	No	Yes	Yes	Yes	Yes
County FE	No	No	Yes	Yes	Yes
Observations	3,227	3,227	3,227	3,227	3,183
R-squared	0.060	0.108	0.697	0.698	0.672

Appendix

Table A1: Nonbanks' market share and servicing-related complaint ratio of nonbanks: Robustness checks

This table presents the OLS estimates from the regression of the county-level servicing-related complaint ratio of nonbanks on nonbanks' market share in the county. The dependent variable is *Servicing-related complaint ratio*, which is the number of post-origination mortgage servicing complaints filed against nonbanks in a year scaled by the number of all mortgages originated by nonbanks in the county in the previous five years. Column (1) includes FHA/VA loans in the sample; column (2) excludes observations in year 2012 from the sample; column (3) excludes complaints filed against Quicken Loans; column (4) excludes complaints filed against the top 3 nonbanks (i.e., Quicken Loans, United Shore Financial Service, Guaranteed Rate Inc.). $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. Standard errors are clustered at the county level.

	Including FHA/VA loans	Excluding 2012	Excluding Quicken	Excluding Top3
	(1)	(2)	(3)	(4)
Nonbank market share	-0.254***	-0.787**	-0.510**	-0.509**
	(0.069)	(0.344)	(0.243)	(0.251)
log(Income per capita)	-0.080	0.274	-0.419	-0.419
	(0.056)	(0.568)	(0.446)	(0.457)
Unemployment rate	-0.042	6.584***	2.689*	2.772*
	(0.220)	(2.202)	(1.530)	(1.560)
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	7,510	6,219	7,169	7,167
R-squared	0.632	0.445	0.439	0.426