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Nonbanks and Mortgage Securitization

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Abstract

This article reviews the dramatic growth of nonbank mortgage lending after the Global Financial Crisis, especially to borrowers with lower credit scores, and the related importance of mortgage-backed securitization. Our literature review suggests that the existing theoretical and empirical work on securitization is more relevant to bank than to nonbank lenders, thus leaving outstanding questions as to why nonbank market shares have increased to their current levels and how best to structure nonbank oversight. To highlight key differences in the mortgage-lending incentives of banks and nonbanks, we build a simple theoretical model of bank versus nonbank mortgage lending and use it to generate and test empirical hypotheses. We find, in particular, that loans issued by nonbanks are more likely to prepay early than loans issued by banks, the difference not explainable by nonbank borrowers prepaying more rationally. Using regulatory filings from nonbanks that are typically unavailable to academic researchers, we examine the balance sheets and liquidity and capital positions of large Ginnie Mae nonbank servicers, which face and pose more risk in the current mortgage system. We find that on average these servicers have reasonable liquidity and capital positions relative to standard regulatory thresholds, particularly in 2022:Q1 after a few quarters of elevated profits. However, some large Ginnie Mae servicers appear to have inadequate capital, as gauged by risk-based capital measures. If defaults rise on a large scale, the liquidity and capital positions of these servicers may amplify the disruption in the mortgage and housing markets.

1. INTRODUCTION

Securitization, where issuers pool mortgages and then issue mortgage-backed securities (MBS) collateralized by those pools, is the dominant source of funding for mortgages in the United States. More than two-thirds of the $12.5 trillion in one- to four-family mortgages outstanding at year-end 2021 were funded through securitization.[1] Historically, securitization served as a means to channel capital from locations where it was abundant to locations where it was scarce (Snowden 1995), thereby better matching borrowers and savers. However, due to inherent frictions in securitization markets that we describe in this article, mortgage-backed securitization has also served as a source of financial instability, most dramatically during the Global Financial Crisis (GFC) but in several other historical episodes as well.

In the last 50 years or so, there have been three main types of MBS in the United States: those guaranteed by the government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac, those guaranteed by Ginnie Mae, and private-label securities (PLS) not guaranteed by either the GSEs or Ginnie Mae. MBS are issued by both banks and nonbanks.[2] We describe these institutions and their role in the securitization market in more detail in Section 2.

Most of the existing literature on mortgage securitization focuses on the bank securitization market and on the experience of the PLS market in the GFC. However, securitization looks very different today than it did prior to the GFC. First, PLS all but disappeared after the crisis, and that portion of the market has still not recovered. Instead, lower-credit-quality mortgages are now funded primarily by Ginnie Mae securitizations. Second, while both nonbanks and securitization have existed in the United States since the 1870s (Snowden 1995), nonbanks have become increasingly dominant players in the mortgage market since the GFC, originating approximately 60% of mortgages in 2020 (versus 35% in 2013) and approximately 90% of the mortgages funded by Ginnie Mae pools (versus 35% in 2013).[3] The vulnerabilities of a mortgage system in which riskier mortgages are originated by nonbanks and securitized in Ginnie Mae pools have received very little attention in the academic literature, with the exception of Kim et al. (2018).

Section 3 reviews the academic literature on mortgage securitization and nonbank lenders, highlighting the reasons why securitization exists, the frictions inherent in securitization, some explanations for why the nonbank market share has increased, and the new and unique risks posed by the growth of nonbanks and Ginnie Mae securitization. The new risks center on servicing: A lender who originates a mortgage also creates the obligation to service it, which involves handling and distributing payments from borrowers and trying to limit losses associated with borrowers who default. Servicing delinquent mortgages imposes liquidity and capital obligations that are substantially higher for nonbank Ginnie Mae issuers than those faced in the past by bank PLS issuers.

In Section 4 we build a simple theoretical model of mortgage lending that incorporates both banks and nonbanks and highlights the interaction between lenders' capital requirements and screening incentives. The model shows that under different circumstances it may be optimal for a

[1] Authors' calculation based on Bd. Gov. Fed. Res. Syst. (2022).

[2] Banks are defined here to include credit unions. Nonbanks are generally finance companies. Some are subsidiaries of bank holding companies, and some have elected to be taxed as real estate investment trusts. We refer to them in this article simply as nonbanks for convenience.

[3] The overall statistics are from Kim et al. (2018) for 2013 and Consum. Financ. Prot. Bur. (2021) for 2020. The Ginnie Mae statistics for both years are from Urban Inst. (2022). This rise is part of the broader increase in nonbank intermediation (Gorton & Metrick 2011, 2012; Gennaioli, Shleifer & Vishny 2012, 2013; Pozsar et al. 2013; Adrian & Ashcraft 2016).

financial institution either to increase or to decrease its exposure to risk. The model predicts that mortgages originated by nonbank lenders are more likely to prepay and default and that nonbank lenders themselves are more likely to go out of business than bank lenders.

We confirm these predictions in Section 5 using merged loan, property, borrower, and performance data and in Section 6 using regulatory data on nonbank balance sheets. We find that loans issued by nonbanks are more likely to prepay early than loans issued by banks. The difference is not explainable by nonbank borrowers prepaying more rationally. We find that loans in Ginnie Mae pools that were originated by nonbanks are also more likely to default early than loans originated by banks. Finally, we show that some nonbanks have less capital than banks; in certain time periods, a sizable fraction would not meet the bank regulatory definition of being well capitalized on a risk-weighted basis.

We then use the regulatory data to identify the aspects of nonbank balance sheets, liquidity, and capital that have implications for the stability of the mortgage system. Comprehensive data on nonbank balance sheets have long been unavailable to researchers, and thus so has basic information on the capital and liquidity of these firms. We focus on the 100 largest nonbank Ginnie Mae issuers since these firms face and pose the greatest risks. These issuers held the servicing rights on 47% of loans in GSE or Ginnie Mae pools as of 2022:Q1. Jiang et al. (2020) also use these regulatory data to compare the capital of bank and nonbank mortgage originators, but we are the first to focus on the risks specific to Ginnie Mae issuers.

We show that nonbank business models vary substantially, with some nonbanks concentrating on originating loans and others focusing more on servicing. We find that nonbank assets are focused in mortgage-related assets that are likely to all perform poorly if mortgage defaults rise, and we also find that the main unencumbered nonbank asset is mortgage servicing rights (MSRs). MSRs are the present discounted value of the anticipated revenue from servicing the pool of mortgages and, as we discuss, can be volatile, illiquid, and hard to value.[4] Most nonbank liabilities are short term and in some circumstances susceptible to runs.

We find that most Ginnie Mae issuers emerged from the pandemic with stronger capital and liquidity positions than they had before, due to the large profits that they accumulated from refinancing mortgages in 2020 and 2021. However, whether these issuers in general are well capitalized depends on whether MSRs are considered high-quality assets. The Ginnie Mae leverage ratio in effect as of June 2022 treats MSRs and cash as equivalent sources of strength, while risk-based capital ratios required for banks, and proposed for Ginnie Mae issuers, do not. Under these risk-based ratios, 25% to 40% of the mortgages in Ginnie Mae pools, depending on the measure, were held by a nonbank that was not well capitalized at year-end 2018, and 20% to 30% were held by such a nonbank in 2022:Q1.

Our analysis highlights the trade-offs that policymakers face in deciding on nonbank capital regulation. In times of stress, Ginnie Mae issuers need capital and liquidity to carry out their obligations with respect to default servicing. MSRs are unlikely to hold their value in those situations. However, the firms that would be most affected by tighter capital regulation play a systemically important role in the liquidity of the MSR market (through their purchases from other firms) and in the operational aspects of mortgage servicing. Policymakers must balance the need to ensure that their counterparties have enough capital and liquidity to carry out their responsibilities with maintaining the liquidity of the MSR market and servicing capacity of the mortgage system.

[4]Eisfeldt & Papanikolaou (2014) and Crouzet et al. (2022) highlight that intangible assets such as MSRs present significant measurement challenges to both economists and accountants.

2. BACKGROUND ON NONBANKS AND SECURITIZATION

2.1. The US Mortgage Market and Securitization

The mortgage market in the United States is enormous and composed mostly of long-term fixed-rate loans. Only approximately $3.2 trillion of the $12.5 trillion in mortgages outstanding at year-end 2021 were funded by banks (Bd. Gov. Fed. Res. Syst. 2022). The sheer size of the market, as well as the fact that most bank liabilities are short term and floating rate, makes the capital markets a natural funding source for the bulk of mortgages.

In the MBS process, issuers pool mortgages and then issue debt securities that are collateralized by the mortgages and sold to investors around the world. The MBS market is the second-largest US fixed-income market, larger than corporate bonds. In addition to creating a funding source that is a better match for long-maturity fixed-rate assets, securitization channels capital from locations where it is abundant to locations where it is scarce, thereby better matching borrowers and savers. Securitization also transforms whole mortgages into multiple assets with different risk-return profiles, thereby better matching investors and assets. Finally, securitization provides long-term cost-effective funding to nonbanks. Since nonbanks would otherwise have a much higher cost of funds than banks, securitization allows nonbanks to compete with banks in the mortgage market and offer more choices to borrowers. We discuss other motivations for securitization in Section 3.1.

2.2. Types of Mortgage-Backed Securities

As mentioned above, in the United States, there are three main types of MBS: those guaranteed by the GSEs Fannie Mae and Freddie Mac, those guaranteed by Ginnie Mae, and PLS without a GSE or Ginnie Mae guarantee. Fannie Mae and Freddie Mac are publicly held financial institutions that were chartered by Congress and have been in government conservatorship since a dramatic deterioration in their financial situation in 2008 (Frame et al. 2015). Fannie Mae and Freddie Mac purchase mortgages from banks and nonbanks and issue MBS collateralized by these mortgages. Ginnie Mae is a wholly owned government corporation. Under its program, banks or nonbanks issue the MBS, and Ginnie Mae provides a guarantee of timely payment of principal and interest to investors. PLS are sponsored by private financial institutions. Fuster, Lucca & Vickery (2022) provide a comprehensive overview of the MBS market.

Securitization has funded 65–70% of mortgages since the early 1990s, but the securitization type has changed dramatically over this period. In particular, the market share of private-label MBS rose significantly in the 2000s, peaking at funding just over 20% of mortgages at the end of 2006, before subsequently plummeting in the GFC. At year-end 2021, approximately half of mortgages were funded by GSE securitizations, a bit less than 20% were funded by Ginnie Mae MBS, and 3% were funded by private-label MBS.[5]

2.3. Comparison of Mortgage-Backed Securities

The three types of MBS pose different risks to investors. Eligible collateral for GSE MBS is loans that meet the underwriting standards of Fannie Mae and Freddie Mac. These mortgages are typically originated to higher-credit-quality borrowers that meet certain income-documentation requirements and need mortgages smaller than a certain size. The GSEs insure investors against

[5] Authors' estimates from Bd. Gov. Fed. Res. Syst. (2022) and Recursion, "Agency Mortgage Market Monthly Update," April 2022. Recursion data are not public.

credit loss on the mortgages and guarantee that investors will receive timely principal and interest payments. Investors in these securities are not exposed to credit risk but are exposed to prepayment risk—that is, the risk that they will receive principal payments at a pace different from what they anticipated, likely because an unexpected change in mortgage rates shifts the rate at which borrowers refinance their mortgages. Before 2008, the GSEs benefited from the market's assumption that the federal government would step in to rescue them if the GSEs were unable to honor their guarantees. Since the GSEs entered conservatorship, they have had more explicit government backing.

Eligible collateral for Ginnie Mae MBS is mortgages that are guaranteed or insured against credit loss by the Federal Housing Administration (FHA), the Department of Veterans Affairs (VA), or a couple of smaller government programs. The borrowers served by these programs tend to have lower credit scores than those who obtain loans guaranteed by the GSEs. Issuers can securitize these loans through the Ginnie Mae platform, and Ginnie Mae guarantees that investors will receive timely payment. Unlike the GSEs, the Ginnie Mae guarantee is an explicit guarantee of the full faith and credit of the US government. As with GSE MBS, investors in these securitizations are exposed only to prepayment risk.

Eligible collateral for private-label MBS tends to be loans that are ineligible for these programs, usually because the size of the loan exceeds the program limit (so-called jumbo mortgages) or the loan does not meet the documentation requirements (nonqualified, or non-QM, mortgages, sometimes also referred to as expanded credit). Before the GFC, this category also included subprime loans, extended to borrowers with low credit scores, and alt-A loans, extended to borrowers who did not want to document income or preferred nonstandard mortgage products. Since the GFC, these borrowers are served by the non-QM market or the FHA market, or they are unable to obtain mortgage credit. Investors in these securitizations are exposed to both prepayment and credit risk.

Securitizations issued by the GSEs and Ginnie Mae are almost all pass-through securities, in which investors receive proportionate shares of the cash flows of the underlying mortgages. Private-label MBS are generally collateralized mortgage obligations that have multiple classes of securities, known as tranches, that differ in their payment priority. These tranches can be designed to appeal to investors with different investment objectives and risk tolerances. In all cases, securitization also creates a separate asset, the MSR. This asset is sometimes retained by the loan originator and sometimes sold to a third-party investor.

3. RECENT LITERATURE

3.1. Theoretical Foundations and Empirical Tests

The theoretical literature on mortgage-backed securitization points to a variety of complementary reasons why simply repackaging a portfolio of individual loans into pools creates value. Some reasons apply to all types of MBS. For example, DeMarzo & Duffie (1999) motivate securitization as a way for issuers to free up capital for higher-return investments, while Loutskina & Strahan (2009) note that securitization can improve a bank's liquidity position.

Most of the theoretical literature applies primarily to private-label MBS, where investors bear credit risk and securitizations have multiple credit tranches, in contrast to pass-through securitization, which dominates the current mortgage market and is the subject of our review. DeMarzo (2005) shows that if the residual risk of the underlying assets is not highly correlated, pooling large numbers of assets can create value through risk diversification. Diamond (1984) suggests that pooling loans may save on monitoring costs. Hartman-Glaser, Piskorski & Tchistyi (2012) find that selling pooled mortgages is more efficient than selling mortgages individually because pooling

allows investors to learn about the underwriter's effort more quickly. Oldfield (2000) notes that issuers can create value by tailoring securities for investors' risk and return preferences; Riddiough (1997) also shows that tranching securities can create value relative to whole-loan sales.

Downing, Jaffee & Wallace (2009), Fusari et al. (2022), and Huh & Kim (2020) document that originators appear to use private information about loan quality in mortgage securitization in the GSE to-be-announced (TBA) market. In the TBA market, investors know only the broad parameters of the MBS that they purchase, and not the individual loans. The findings are more mixed on this question for the subprime private-label market before the GFC, with Calem, Henderson & Liles (2011) finding such adverse selection, Agarwal, Chang & Yavas (2012) finding more mixed results, and Jiang, Nelson & Vytlacil (2014) finding that investors were able to overcome the informational asymmetry.

Investors know that issuers face these incentives, and so discount the price that they are willing to pay accordingly. Issuers who originate high-quality loans, and who do not want to receive such lemon pricing, can take actions to reveal the quality of their loans, as in the classic signaling model of Spence (1974). One such mechanism is credit-risk retention. Because it is more costly for originators to retain bad loans than good ones, retention may signal quality to investors, as in Leland & Pyle (1977). Originators' ability to signal through retention is consistent with the findings in Begley & Purnanandam (2017, 2021) and Ivashina (2009). Likewise, Vanasco (2017) concludes that the optimal mechanism to implement asset screening is costly retention of cash flows. Adelino & Hartman-Glaser (2019) find that MBS issuers can signal the quality of their securitizations by extending the time between mortgage origination and securitization. Hartman-Glaser (2017) models the interaction between retention and an issuer's reputation for honesty in signaling asset quality. Winton & Yerramilli (2021) also focus on the interaction among reputation concerns, loan retention, and monitoring effort on the part of issuers. Daley, Green & Vanasco (2020) find that, under certain conditions, external credit ratings can reduce the need for an issuer to retain loans to signal their credit quality.

Information asymmetries also give originators an incentive to underwrite with less care: Under the originate to distribute (OTD) model, in which they sell their originations to third-party investors, the credit risk is borne by the investor or the government securitization guarantor. Multiple studies have found that the informational problems in the OTD model, specifically in private-label MBS, led to a deterioration in underwriting before the GFC (see Mian & Sufi 2009; Keys et al. 2010, 2012; Purnanandam 2011; Nadauld & Sherlund 2013; Elul 2016). Bubb & Kaufman (2014) and Foote & Willen (2018), however, cast some doubt on the idea that these frictions were as central to the GFC.

Securitization also splits the mortgage from the obligation to service it and may cause a principal-agent conflict between the MBS investor and servicer. Several studies have shown that the servicer may have different incentives from the investor, particularly with regard to preserving value for investors when mortgages default (see Piskorski, Seru & Vig 2010; Aiello 2022). Adelino, Gerardi & Willen (2013, 2014), though, suggest that other factors may also explain these findings.

As a whole, many of these studies focus on securitization from the perspective of a bank issuer or focus on the private-label MBS market and the GFC period. This work is only partially informative about the current securitization market, in which most issuers are nonbanks that fund themselves through GSE- and Ginnie Mae–guaranteed securitizations. For example, issuers in the GSE and Ginnie Mae markets are not required to retain any risk in these securitizations under current risk retention rules. Instead, MSRs, which are not covered in any of these studies, serve as the primary form of skin in the game for these issuers because servicing costs are higher for mortgages that default. Our article thus attempts to fill the gap noted by Metrick & Tarullo (2021):

"The precrisis developments in mortgage finance have been well studied, but the postcrisis shift in nonprime mortgage finance has received far less scholarly attention."

3.2. Why Has Nonbank Market Share Increased Since the Global Financial Crisis?

The post-GFC decline in the bank share of mortgage originations is generally attributed to regulatory changes and nonbanks' quicker adoption of new technologies (Buchak et al. 2018). Some of these regulatory changes—such as stress testing (e.g., Gete & Reher 2018; Calem, Correa & Lee 2019), higher capital requirements (e.g., Gertler, Kiyotaki & Prestipino 2016; Dempsey 2020; Irani et al. 2021; Reher 2021; Begenau & Landvoigt 2022; Chernenko, Erel & Prilmeier 2022), and the liquidity coverage ratio (Roberts, Sarkar & Shachar 2021)—affect only banks. Other post-GFC developments—such as the qualified-mortgage requirements (e.g., DeFusco, Johnson & Mondragon 2020); litigation risk (e.g., Gissler, Oldfather & Ruffino 2016, D'Acunto & Rossi 2022); and putback requests, attempts to recover credit losses, and foreclosure-related litigation (Kim et al. 2018)—affect both banks and nonbanks. However, these developments may weigh more heavily on bank decision making because banks are scrutinized more closely by their regulators and because banks' multiple lines of business and higher franchise value, relative to the monoline nonbank mortgage model, make it more costly to go out of business in response to large losses.

Some nonbank originators, which we refer to as fintech nonbanks, have also been quicker to harness technological innovation in general (see Gertler, Kiyotaki & Prestipino 2016; Ordoñez 2018) and automated underwriting for consumer credit (see Buchak et al. 2018, Fuster et al. 2019, Bartlett et al. 2022). Originators such as Rocket Mortgage (the former Quicken Loans) originate some mortgages almost entirely online with no human loan officer. Additionally, fintech lenders may be better able to screen potential borrowers, leveraging alternative sources of information and the big data approaches inherent in technology-based lending (see Blattner & Nelson 2021).

Although banks have stepped back from originating mortgages directly, they have increased their role in two other parts of the mortgage market. First, banks provide the warehouse lines of credit that nonbanks use to finance their mortgage originations (Jiang 2021). The Bankruptcy Abuse and Consumer Protection Act (BACPA) in 2005 made it easier for warehouse creditors to seize their collateral and thereby increased banks' interest in extending these lines. The BACPA changes also reduced nonbank costs and contributed to rapid nonbank growth both pre-2008 (e.g., Ganduri 2021, Lewis 2021) and post-GFC (see Kim et al. 2018, Metrick & Tarullo 2021).

Second, banks are major holders of MBS. Banks have an incentive to hold GSE- or Ginnie Mae–guaranteed MBS, rather than the equivalent whole loans, because the MBS have lower capital charges as a result of the government guarantees. As of year-end 2021, commercial banks held nearly $2.5 trillion of the roughly $9.4 trillion in agency MBS outstanding.[6]

The increase in nonbank market share has brought benefits to consumers. Nonbanks can be more nimble than banks in entering new markets, adapting to changing market conditions, and adopting new technologies. Gete & Reher (2021) find that the increased nonbank market share may be welfare improving due to increased access to homeownership. Nonbanks may also have played a role in maintaining access to credit after the GFC. The sharp rise in the nonbank market share of mortgages funded by Ginnie Mae pools post-GFC, for example, suggests that borrowers with lower credit scores would have faced tighter credit conditions without nonbank lenders.

Nonbanks also bring financial stability risks to the mortgage market because they (*a*) are reliant on short-term, runnable funding; (*b*) are not required, in some cases, to hold the liquidity and

[6]Authors' calculations from data used to construct the *Financial Accounts of the United States*.

capital necessary to carry out their responsibilities under their servicing contracts; and (*c*) may amplify house price cycles by originating and servicing loans with less care than they would if they held the full credit risk of the mortgage. We briefly summarize these risks here and refer the reader to other studies (see Kaul & Goodman 2016; CSBS 2017, 2021b; Kim et al. 2018; Financ. Stab. Overs. Counc. 2020; Gete & Reher 2021; Hubbard et al. 2021) for more details.

First, with regard to short-term funding, as described in Section 3.2, nonbanks fund their mortgage originations on short-term warehouse lines of credit until the mortgages are securitized. In times of stress, and especially when the nonbanks are in violation of the line performance covenants, warehouse lenders can tighten terms on the lines, require more margin, or cancel the lines altogether, leading to a contraction in credit availability, asset fire sales, and funding freezes. Some nonbanks also have financing facilities for other purposes that are collateralized by their MSRs; some of these facilities are longer term. Unlike banks, nonbanks cannot turn to the Federal Home Loan Bank System or the Federal Reserve System for liquidity when their other sources of funding dry up. Kim et al. (2018) and Pence (2022) describe how these dynamics played out in the GFC and in spring 2020, respectively. In addition, some MBS investors are dependent on short-term runnable funding (see Metrick & Tarullo 2021, Pence 2022), and runs on this funding can affect the ability of nonbank originators to obtain long-term securitization funding. These risks relate to the larger literature on the run risk associated with the shadow banking system (see Gorton & Metrick 2011, 2012; Hanson et al. 2015).

Next, with regard to servicing contracts, as discussed in detail in Kim et al. (2018), servicers for all types of securitizations—GSEs, Ginnie Mae, and PLS—are required to advance principal and interest to investors on behalf of mortgage borrowers who do not make their payments. Servicers are eventually repaid these advances but must finance them in the interim. Servicers are obliged to advance payments only for a few months for loans in GSE-guaranteed pools; in PLS pools, servicers are not required to advance any funds that they do not anticipate being able to recover. However, for Ginnie Mae pools the obligations can stretch out for much longer. Servicers are also exposed to credit losses on Ginnie Mae pools because servicers are required to absorb any losses not covered by FHA or VA insurance.

Servicing advances became a major policy concern in spring 2020. As part of the pandemic response, Congress implemented broad-based forbearance for mortgage borrowers but did not provide a funding mechanism for the servicers that advanced these payments on behalf of borrowers. The servicers weathered the strain because of policy interventions and the cash windfall they received from mortgage refinancing (Pence 2022).

As we show in more detail in Section 6, some servicers do not appear to be holding the liquidity or capital necessary to carry out their obligations under the Ginnie Mae contract. In addition, because their business model centers almost exclusively on mortgage-related activities, their income and their assets are heavily exposed to shocks to house prices and interest rates. Thus, a rise in mortgage delinquencies will likely lead to a simultaneous rise in nonbank obligations under their servicing contracts and to a drop in their income and assets. As nonbanks come under strain in this scenario, they are likely to cut back on their loan originations and on the quality of their servicing, which could weigh on mortgage credit supply and contribute to unnecessary foreclosures.

Finally, nonbanks do not hold on to their loan originations, and as described in Section 3.1, the OTD model gives them less incentive to underwrite mortgages with care. They also do not bear the full credit risk of the loans that they service, and so they may not always service loans in a way that preserves value for the investor. These incentive issues may amplify house price cycles. Originating low-quality mortgages may increase the supply of credit to marginal borrowers and boost house prices. Defaults on these mortgages, coupled with poor-quality servicing, may increase

foreclosures, and these property fire sales may weigh on house prices. Buchak et al. (2018) find that nonbank mortgages are more likely to be delinquent than are mortgages originated by banks.

Nonbanks with insufficient liquidity and capital may be particularly prone to these behaviors because the cost of bankruptcy and lost franchise value is lower. Cherry et al. (2021) and Kim et al. (2022) show, for example, that borrowers with mortgages serviced by nonbanks, and especially nonbanks with less liquidity or capital, were less likely in 2020 to receive coronavirus disease 2019 (COVID-19)-related forbearance relief under the CARES Act, despite appearing to be eligible.

3.3. Nonbank Oversight

Nonbanks are regulated more lightly for prudential purposes than are banks. State banking supervisors are given this prudential responsibility and have taken steps such as establishing model prudential standards (CSBS 2021a), but some observers have cast doubt on the state regulators' ability to provide comprehensive prudential supervision (Hubbard et al. 2021). Instead, the Federal Housing Finance Agency (in its role as conservator of Fannie Mae and Freddie Mac), Ginnie Mae, and warehouse lenders serve as de facto nonbank regulators through the capital and liquidity requirements they set for their counterparties. However, these entities set their requirements with the goal of protecting their own interests, rather than preserving the stability of the mortgage system as a whole, and overall there is no comprehensive capital regulation or regulatory stress testing of nonbanks. Several studies (Kim et al. 2018, Jiang et al. 2020, Hubbard et al. 2021), as well as our analysis in Section 6.3, consider the liquidity and capital positions of nonbanks, but no existing studies provide a framework for how much liquidity and capital these entities should have.

In recent years, government agencies and outside observers have developed some preliminary reform proposals (see US Dep. Treas. 2019, Kaul & Goodman 2020, Kaul & Tozer 2020, Hubbard et al. 2021, Metrick & Tarullo 2021). The proposals consider, for example, whether a single federal prudential regulator for nonbank mortgage companies would be more effective than the existing state-based system. The proposals also ask whether the federal government should provide a liquidity backstop for nonbank mortgage companies, either by permitting membership in the Federal Home Loan Bank system or by creating a backstop facility in times of crisis. Expanding the scope of the Federal Home Loan Banks, however, also carries risks (Flannery & Frame 2006; Ashcraft, Bech & Frame 2010; Gissler & Narajabad 2017; Sundaresan & Xiao 2021).

4. ANALYSIS FRAMEWORK

The existing theoretical literature focuses on securitization from the bank perspective, even though the majority of mortgage originators and MBS issuers in the post-GFC period are nonbanks. In this section, we therefore introduce a parsimonious framework of a market with banks and nonbanks, focusing on the previously discussed differences between these lending entities. Specifically, nonbanks have access to novel technologies, making their loan handling more efficient (faster) and allowing for more rapid removal of newly originated loans from their balance sheets.[7] Additionally, as discussed above, nonbanks are monolines with less franchise value and less vigilant regulators than banks, and so they have a more viable option to go out of business. As a consequence, banks and nonbanks may have different incentives to screen borrowers in a market with loan applications of heterogeneous quality.

[7] As discussed in Kim et al. (2018), newly originated mortgages generally sit on nonbank balance sheets for two weeks or less. In contrast, in the GSE market, larger banks primarily swap their newly originated mortgages for MBS composed of their own loans. Thus, their balance-sheet holdings of their own securities are long, and banks are the dominant long-term investors in these securities.

We use our framework, which is necessarily very stylized, to analyze and discuss the implications of these major differences between banks and nonbanks. We further discuss the implications below in this article, when analyzing the data.

4.1. Societal Value of Mortgages

A large number of agents (potential borrowers) are in the market for mortgage loans. Each agent is of type $v \in \{\ell, h\}$. Agents of type ℓ are vulnerable to shocks, whereas those of type h are resilient against such shocks.

A social planner associates societal value $A > 0$ with a resilient type obtaining a mortgage loan (the resilience benefit) and $-B < 0$ with a vulnerable type obtaining such a loan (the vulnerability cost). Associated with each agent is hard information $p \in (0, 1)$ such that, conditioned on p, the probability that the agent is of the resilient type is p. The hard information can be thought of as that found in a credit report, which is easily measured and straightforward to quantify. We refer to p as the agent's score.

There also exists soft information about an agent's resilience, which can be obtained by screening, at a cost $C > 0$. We may think of such screening as the gathering and evaluation of soft information, a fairly human capital–intensive effort. For example, a loan officer may need to spend time interviewing a potential borrower or going over a number of documents to see whether there are any patterns in historical behavior that raise a red flag.

For simplicity, we assume that C is the same for all agents and that the soft information allows for unambiguous identification of the agent's type. Moreover, we focus on the economically interesting case in which the cost of soft information is not too high, $C < \frac{AB}{A+B}$.

Without soft information, the social planner prefers a mortgage to be extended to a potential borrower if the expected resilience benefit outweighs the expected vulnerability cost, i.e., if $Ap + (1 - p)(-B) > 0$. So mortgages should be extended to agents with associated scores

$$p > p^* \stackrel{\text{def}}{=} \frac{B}{A+B}.$$

When soft information is available, the planner views the following outcome as optimal:

> **Proposition 1.** In the first-best outcome: (*a*) no agent with score $p < \frac{C}{A}$ obtains a loan; (*b*) soft information is obtained for agents with scores $\frac{C}{A} \le p \le 1 - \frac{C}{B}$, and only the resilient agents within this pool obtain loans; and (*c*) all agents with scores $p > 1 - \frac{C}{B}$ obtain loans.

The differences between the two outcomes are that resilient agents with scores $p \in [\frac{C}{A}, \frac{B}{A+B})$ obtain loans when soft information is available, and vulnerable agents with scores $p \in [\frac{B}{A+B}, 1 - \frac{C}{B})$ do not, which increases the precision of loan allocations.

4.2. Mortgages, Lending, and Securitization

A mortgage loan is characterized as follows: The borrower receives \$1 and commits to pay the lender an annuity stream with long maturity. For simplicity, we assume that payments are structured as a perpetuity; i.e., the borrower commits to pay the mortgage rate of s dollars per unit time to the lender in perpetuity. Here, $s > r$, where r is the discount rate. Time is continuous, and the horizon is infinite, $t \ge 0$.[8]

[8]Note that for a resilient agent, the total surplus value generated by extending a loan is $\frac{s}{r} - 1$. This is therefore an upper bound on the total surplus value of extending a loan to an agent who may be vulnerable. For

Borrowers may be hit by publicly observable shocks, the arrival of which is governed by a Poisson process with arrival intensity λ. When a shock arrives, a vulnerable borrower defaults and immediately stops making payments on the mortgage. Resilient borrowers are not affected by shocks; one can therefore infer that a borrower who continues to pay after the arrival of a shock is resilient. For simplicity, we assume that no value is recovered by the lender when a borrower defaults. The most straightforward interpretation of the shock is a macroeconomic event that triggers default among all vulnerable borrowers.[9]

Mortgage lenders fund loans with a combination of equity and debt. The interest a lender pays on such funding debt, the funding rate, is q. Here,

$$0 < r < q < s < r + \lambda.$$

These inequalities ensure that there is a funding rate premium over the discount rate and a mortgage rate premium over the funding rate. Also, the condition $s < r + \lambda$ ensures that our focus is on the economically interesting case for which it is not profitable for a lender to lend to a borrower who is surely of the vulnerable type. Debt is also structured as a perpetuity, possibly because of maturity matching. To keep things simple, we assume that each lender handles exactly one potential borrower.

Supplemental Material >

We interpret the shock as a default event. In the **Supplemental Material**, we extend the model to also include prepayment risk. In the extension, higher prepayment risk leads to a lower expected future surplus generated by the spread between the lending rate and the funding rate, although the cost associated with prepayment is less severe than under default since the capital is recovered when there is prepayment whereas it is not under default.

A lender that uses equity capital e to fund a mortgage needs debt funding of $d = 1 - e$. The lender's capital ratio is then e. The choice of e may be restricted because of regulation, i.e., subject to the constraint $e \geq \underline{e} \geq 0$. A lender's surplus, $s - qd$, is instantaneously paid out as a dividend to equity holders, and thus the equity ratio remains constant over time, as long as there is no shock. If a shock hits a vulnerable borrower and the corresponding bank has chosen $e < 1$, it defaults.

A mortgage may be securitized T periods after issuance, as long as it has not defaulted at that point. For simplicity, we assume that securitized mortgages are fully insured by a GSE. They are therefore worth $P = \frac{s}{r}$ in the competitive market.

After a mortgage has been securitized, the lender repays its debt and distributes the surplus to equity holders. Since P is the value of the mortgage if the borrower is known to be resilient, it is always optimal for the lender to securitize the loan at T.[10]

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parsimony, we treat s as an exogenous parameter, and we assume that it is independent of agent score. The difference between s and r could, for example, arise because of operational fixed costs that a lender needs to cover via marginal profits on individual loans. It could also arise through barriers to entry that make the industry less than perfectly competitive. This approach is thus inherently a partial equilibrium with respect to discount rates. We view the endogenization of s as an interesting future extension.

[9]We can think of this as the limit of a discrete-time model with time interval Δt that tends to zero, where in each period a shock hits with probability $\lambda\,\Delta t$ and payments occur at the end of the period if default has not yet occurred.

[10]This can be seen via the following argument: The time T cash flow associated with immediately securitizing is $V_T = \frac{s}{r} - d$, where the debt level satisfies $0 \leq d \leq 1$. If, instead, the lender waits until $T' > T$, the discounted value of future cash flows is $V_{T'} = \int_T^{T'} e^{-r(t-T)}[p + (1-p)e^{-\lambda(t-T)}](s - qd)dt + e^{-r(T'-T)}[p + (1-p)e^{-\lambda(T'-T)}]\left(\frac{s}{r} - d\right)$, which represents the discounted expected cash flows associated with waiting. One verifies from this expression that the two conditions $\frac{s}{r} > d\frac{\lambda+r-q}{\lambda}$ and $\frac{s}{r} - d \geq \frac{s}{r} - \frac{q}{r}d$ are jointly sufficient for $V_T > V_{T'}$. Now, $\frac{s}{r} > 1 \geq d = d\frac{\lambda}{\lambda} \geq d\frac{\lambda+r-q}{\lambda}$, where the rightmost inequality follows from $q \geq r$, so the first

Absent soft information, the value for a lender of issuing a mortgage to an agent with score p, using equity capital e, is then

$$V = \left[pe^{-rT} + (1-p)e^{-(r+\lambda)t}\right]\left(\frac{s}{r} - d\right) + \left[p\frac{1-e^{-rT}}{r} + (1-p)\frac{1-e^{-(r+\lambda)T}}{r+\lambda}\right](s - dq) - e. \quad 1.$$

This is the loan value function. On the right-hand side of this expression, the first term represents the present value of future securitization, the second term represents the present value of cash flows before securitization, and the third term represents the initially invested capital.

4.3. Banks

A traditional bank faces a relatively long period T before securitization may occur. For simplicity, we use the approximation $T = \infty$.[11,12] The loan value function for a bank therefore reduces to

$$V = \frac{r + p\lambda}{r(r+\lambda)}[s - q(1-e)] - e. \quad 2.$$

A lending bank chooses the capital ratio e that maximizes V. Two factors influence this choice. First, a higher capital ratio increases the surplus dividends, since $s > q$, providing an incentive for the bank to choose a high e. Second, a lower capital ratio decreases the loss to equity holders in case of borrower default, providing an incentive to choose a low e. The latter incentive is more important when p is low. The former incentive is more important when p is high (since the expected length of dividend payments is increasing in p).

The following result characterizes a bank's joint optimal choice of whether to lend and the capital ratio conditional on lending:

Proposition 2. Define $p_1^* \overset{\text{def}}{=} \frac{r(r+\lambda-s)}{s\lambda}$ and $p_2^* \overset{\text{def}}{=} \frac{r(r+\lambda-q)}{q\lambda}$, and note that $0 < p_1^* < p_2^* < 1$. The bank optimally chooses lending and capital ratios as follows:

1. When $p > p_1^*$, the bank lends regardless of e, whereas if $p \le p_1^*$ it lends only if it can choose
$$e \le e^* \overset{\text{def}}{=} \frac{(s-q)(r+p\lambda)}{r(r+\lambda-q) - pq\lambda}.$$
2. If $p > p_2^*$, the bank chooses e as high as possible—i.e., $e = 1$—leading to value
$$V = \frac{r+p\lambda}{r(r+\lambda)}s - 1.$$
3. If $p < p_2^*$, a lending bank will choose e as low as possible: $e = \underline{e}$.

condition holds. Moreover, $q \ge r$ also implies that the second condition holds. Thus, $V_T > V_{T'}$, and it is always optimal for the lender to securitize as quickly as possible.

[11] The approximation captures the general idea that a traditional bank is exposed to mortgage risk for an extensive time period after origination, potentially via so-called putback options after the loan has been sold, as discussed in Kim et al. (2018). Loans in default can be put back to nonbank lenders as well, but in the aftermath of the GFC, this remedy was not effective, because many nonbanks went out of business.

[12] Even after the loans have been securitized, banks—but not nonbanks—often buy them (or swap them back) in securitized form, which is economically very close to holding on to them, again supporting the idea that T is larger for banks than for nonbanks. Of course, in the model, banks would not want to continue holding on to the loans in this way, since $q > r$, but in reality regulatory-capital rules provide an incentive for this behavior.

Note that the function $e^*(p)$ defined in Part 1 of Proposition 2 is increasing in p and that $e^*(0) = \frac{s-q}{r+\lambda-q}$.

A regulator who does not want mortgages extended to agents who are known to be vulnerable (i.e., those with score $p = 0$), in line with the social planner's views discussed above, will set the regulated minimum capital ratio above $\frac{s-q}{r+\lambda-q}$. We therefore henceforth assume

$$\underline{e} > \frac{s-q}{r+\lambda-q}.$$

We incorporate the bank's option to obtain soft information about an agent into the decision problem. Recall that the bank has the option to pay C to resolve uncertainty about the resilience of an agent and will then lend only if the agent is resilient. The expected net payoff when soft information is obtained is then

$$V^C = p\left(\frac{s}{r} - 1\right) - C. \qquad 3.$$

The bank compares the loan value function V with V^C, leading to the following optimal behavior:

Proposition 3. Define the threshold cost

$$C^* \stackrel{\text{def}}{=} \frac{(q-r)(r+\lambda-s)}{q\lambda}$$

and the threshold minimal capital ratio

$$\underline{e}^* = \frac{(s-q)(s-r+\lambda C)}{(s-r)(r+\lambda) - q(s-r+\lambda C)}.$$

The bank proceeds as follows:

1. If $C > C^*$, the bank does not obtain soft information regardless of p and lends to an agent with $p \geq p_1^*$, in accordance with Proposition 2.
2. If $C < C^*$ and $\underline{e} > \underline{e}^*$, the bank
   - neither obtains information about nor lends to an agent with score $p < C\frac{r}{s-r}$;
   - obtains information about an agent with score
   $$p \in \left(C\frac{r}{s-r}, 1 - C\frac{r+\lambda}{r+\lambda-s}\right)$$
   and lends only if the agent is resilient;
   - lends to, but does not obtain information about, an agent with score $p > 1 - C\frac{r+\lambda}{r+\lambda-s}$.
3. If $C < C^*$ and $\underline{e} < \underline{e}^*$, the bank
   - does not obtain information about and does not lend to an agent with
   $$p < \frac{\underline{e}r(r+\lambda-q) - r(s-q)}{[s-q(1-e)]\lambda};$$
   - does not obtain information about an agent with score
   $$p \in \left(\frac{\underline{e}r(r+\lambda-q) - r(s-q)}{[s-q(1-e)]\lambda}, \frac{r[\underline{e}(\lambda+r-q) - (s-q) - C(r+\lambda)]}{r(r+\lambda-s) - q(1-e)\lambda}\right),$$
   lends to the agent, and minimizes capital $e = \underline{e}$;
   - obtains information about an agent with score
   $$p \in \left(\frac{r[\underline{e}(\lambda+r-q) - (s-q) - C(r+\lambda)]}{r(r+\lambda-s) - q(1-e)\lambda}, 1 - C\frac{r+\lambda}{r+\lambda-s}\right)$$
   and lends only if the agent is resilient; and
   - lends to, but does not obtain information about, an agent with score $p > 1 - C\frac{r+\lambda}{r+\lambda-s}$.

The proposition shows that, when the costs of obtaining information are not too high, $C < C^*$, the regulator can make traditional banks lend to agents with lower scores by lowering the required capital ratio. However, this will not induce banks to obtain soft information about the additional agents with low scores who receive loans. Instead, the bank lends to all such agents, without obtaining soft information, and chooses minimal capital ratios, anticipating default if a vulnerable agent is hit by a shock. Note that the score threshold above which a bank does not obtain soft information and lends to all agents is unaffected by any change in $\underline{e}$. The only way for a regulator to impact the upper threshold is by affecting the cost of obtaining information C, the mortgage rate s, the discount rate r, or the shock rate λ. **Supplemental Figure 1** shows the bank's behavior in each of the three cases. More details of the bank's behavior appear in the **Supplemental Text**, **Section 1**.

Supplemental Material >

4.4. Nonbanks

Nonbanks differ from banks in two dimensions. First, they are less regulated and as a consequence face lower minimal capital ratios, $\underline{e}^{\mathrm{NB}} < \underline{e}$. Second, they have access to a technology that allows them to sell a mortgage faster than a bank. Specifically, it takes a nonbank the time $S < T$ to sell a mortgage.[13] To simplify the analysis, we focus on the case in which S is small. In this case, we can use the approximations $e^{-\lambda S} \approx 1 - \lambda S$, $e^{-rS} \approx 1 - rS$, which leads to the following approximate loan value function for a nonbank:

$$V^{\mathrm{NB}} = \left(\frac{s}{r} - 1\right) - \lambda(1-p)\frac{s}{r}S + (e-1)[q - r - \lambda(1-p)]S.$$

It follows that when S is small, it is never worthwhile for a nonbank to obtain soft information, since the nonbank faces a much lower risk of being affected by mortgage default for any given loan.

The sign of the coefficient $q - r - \lambda(1-p)$ multiplying eS in the nonbank's loan value function determines its optimal capital ratio. A nonbank therefore chooses the minimum possible capital ratio, $e = 1$, if and only if $p > p_3^* = \frac{r+\lambda-q}{\lambda}$. Otherwise, it chooses $e = \underline{e}^{\mathrm{NB}}$. We summarize these results in the following proposition.

> **Proposition 4.** A nonbank lends to all agents, never obtains soft information, and chooses the following capital ratio $e = \underline{e}^{\mathrm{NB}}$ if $p \le p_3^*$, and $e = 1$ otherwise.

Note that $p_3^* = \frac{r}{q}p_2^* < p_2^*$, so the nonbank always chooses a higher score threshold than the bank, above which it is fully capitalized. It is also less discriminatory below the threshold in its lending. Altogether, the risk that it defaults when a shock arrives is therefore higher than for a bank. Banks and nonbanks choose similar (high) capital ratios when lending to prime borrowers. If $\underline{e} \approx \underline{e}^{\mathrm{NB}}$, then they also choose similar (low) capital ratios when lending to agents with low scores. For agents with intermediate scores, nonbanks may choose to be less capitalized than banks and lend more aggressively since they do not screen these agents.

In the **Supplemental Text**, **Section 2**, we introduce heterogeneous prepayment risk across agents, modeled by a four-state Markov process as illustrated in **Supplemental Figure 2**, and show that nonbanks still lend to all agents since they can securitize the mortgage before prepayment occurs. Banks, in contrast, become more conservative in lending to agents with high prepayment

[13] In line with our previous discussion about putback options, the difference between S and T also captures differences in exposure to such options between nonbanks and banks. Indeed, qualitatively similar results to those we derive will arise when these differences in exposure are the main reason why $S < T$.

risk since prepayment decreases the expected surplus from future cash flows and securitization. As a consequence, loans originated by nonbanks have higher average prepayment rates than loans originated by banks.[14]

As noted in our above discussion about banks, when the planner provides incentives for a traditional bank to lend to low-score segments of the population, it has the unwanted side effect of making the bank less prone to obtaining soft information about such agents, some of whom were previously screened. An alternative may be for the planner to keep the minimal capital ratio high for traditional banks and to set a lower rate for nonbanks. With this approach, banks continue to optimally screen the low-score segments they lend to, and the nonbanks serve the lowest segment without screening.

4.5. Implications of Framework

We summarize the different implications for bank and nonbanks as follows:

1. Bank-originated mortgages default less often than nonbank mortgages, especially in times of financial distress.
2. The prepayment rate of bank-originated mortgages is lower than that of nonbank mortgages.
3. Banks are less likely to go out of business than nonbanks.
4. Banks' loan-origination processes are more costly, and especially more labor intense, than those of nonbanks.
5. Banks and nonbanks may choose similar levels of capitalization when serving low- and high-score borrowers, but nonbanks choose lower capital ratios when serving intermediate-score borrowers and lend more aggressively to these borrowers than do banks.
6. The amount a bank invests in screening may be nonmonotone in borrower score, p.

5. MORTGAGE PERFORMANCE: BANKS VERSUS NONBANKS

In this section, we test the model's prediction that loans originated by nonbanks will prepay more quickly than those originated by banks.

5.1. Data

To analyze loan performance, we use linked loan-level data from several providers. Our description here borrows heavily from the work of Bartlett et al. (2022), which uses the same data to study lending discrimination and which should be consulted for additional details. The specific data providers used are as follows:

- Home Mortgage Disclosure Act (HMDA) data include information on applicant income, race, ethnicity, loan amount, and lender name, as well as the census tract of the property.
- ATTOM data provide transaction and assessor information, including lienholder name, loan performance data (i.e., prepayment and default), borrower and lender names, and exact property location, but provide very little information on mortgage contract terms other than the loan amount, the origination date, the purpose of the loan, and whether it is a fixed or floating contract.

[14]This result is not about whether and how banks and nonbanks participate in the market for refinancing. Rather, the result covers the differentiated response to future prepayment risk of a potential borrower (whether or not that borrower is refinancing).

- McDash data provide loan-level data compiled by Black Knight Financial Services and include detailed mortgage terms (including interest rates, loan amount, loan-to-value ratio (LTV), and zip code of the mortgaged property) and month-by-month mortgage performance information.

We exploit overlapping variables within the HMDA, ATTOM, and McDash data sets to construct a merged data set of candidate loans with performance information, contract terms, the mortgage lender type (banks versus nonbanks), and borrower information. To standardize our loan-pricing analysis, we focus on candidate loans in each data set that are first-lien, fixed-rate, owner-occupied, 30-year, single-family residential loans, securitized by the GSEs or insured or guaranteed by the FHA and VA over the period 2005–2015. We exclude manufactured housing, investment properties, condos, duplexes, triplexes, quadraplexes, and loans with outstanding second liens at origination. We also impose minimum and maximum loan-to-value ratios and minimal credit scores, among other filters discussed in more detail in the Internet appendix to Bartlett et al. (2022). Our overall merge rate for candidate loans is 73.99%, and the final filtered data set includes loans from all states.

5.2. Performance Comparison

Two of the main implications of Section 4 are that bank-originated mortgages should default less and prepay more slowly than nonbank mortgages (see Implications 1 and 2). These implications are supported by existing studies. Using HMDA data merged with performance data from Fannie Mae and Freddie Mac for loans issued between 2010 and 2013, Buchak et al. (2018) find that loans originated by nonbanks are more likely to be at least 60 days delinquent within 2 years of issue than loans originated by banks. The result is mostly driven by nonbanks that do not employ fintech, as loans from fintech nonbanks behave similarly to those from banks. However, the differences are small in magnitude, and Buchak et al. (2018) note that, because default risk is insured by the GSEs while prepayment risk is not, prepayment risk is more important to originators than default in this market. They find much larger differences in prepayment behavior, with loans from nonbanks in general between 16% and 22% more likely to prepay within 2 years than comparable loans from traditional banks. Fintech nonbanks exhibit even higher differences.

Using Equifax's CRISM data, which merges McDash mortgage servicing records with Equifax credit bureau data, between 2010 and 2016, Fuster et al. (2019) try to determine

> whether this fact reflects faster-prepaying borrowers selecting into mortgages from FinTech lenders, or whether FinTech lending directly affects the likelihood of refinancing, thereby potentially affecting aggregate refinancing behavior. If FinTech mortgage lending does affect the market-wide propensity to refinance, an important follow-up question is whether this is due to a reduction in errors of omission (meaning that more borrowers who should refinance do so), or instead reflects an increase in errors of commission (more borrowers refinance even when they should not).

They find that prepayment rates are higher in counties with a higher fintech market share, suggesting that the higher prepayment rates are county wide rather than being limited to just the individual borrower who selected fintech lenders. Next, they use the square root optimal-refinancing rule from Agarwal, Driscoll & Laibson (2013) to split the sample into buckets by how much the prepayment option is in the money, and they find that the faster-refinancing effect is strongest when the refinancing option is at, or just in, the money, and this effect is actually negative when the refinancing incentive is negative. They conclude: "In sum, the results suggest that a higher share of FinTech lending is associated not just with faster refinancing, but also more

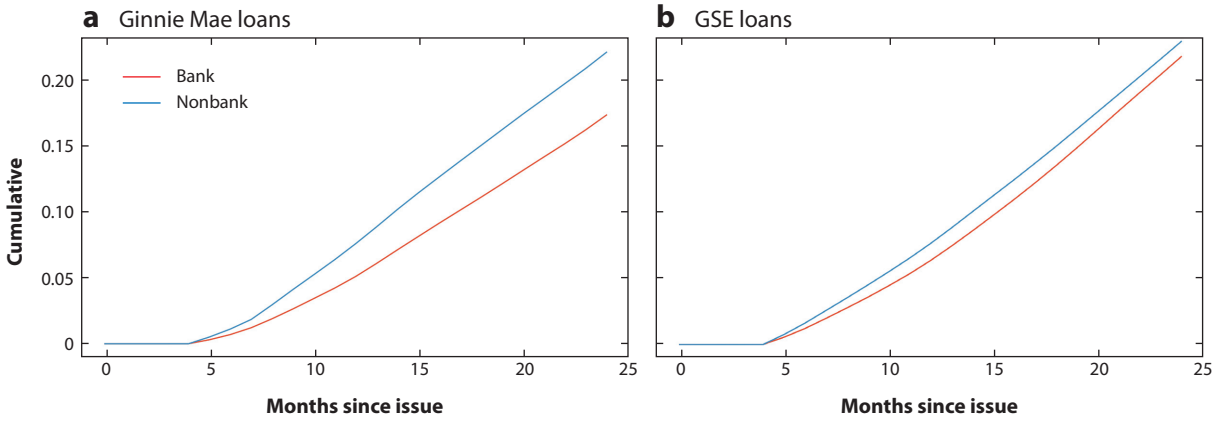

Figure 1

Cumulative prepayment in the first 24 months after issue for loans issued by banks versus nonbanks. (*a*) Ginnie Mae loans. (*b*) GSE loans. Abbreviation: GSE, government-sponsored enterprise.

optimal refinancing decisions, at least on average. This effect, however, appears somewhat weaker for the borrowers that would benefit most from refinancing."

We revisit these results, using the mortgage performance data described in Section 5.1. **Figure 1** shows cumulative mortgage prepayment within the first 2 years of loan issue, split by whether the issuer was a bank or a nonbank institution. Panels *a* and *b* of **Figure 1** split these results by loans funded in Ginnie Mae versus GSE pools. It can clearly be seen that loans issued by nonbanks are on average substantially more likely to prepay quickly than are loans issued by banks, especially for Ginnie Mae loans. This is likely related to the issue of VA loan-churning (see US House 2018; Goodman, Golding & Neal 2019), but it is important to note that we see prepayment differences for GSE as well as Ginnie Mae loans.

The prepayment differences seen in **Figure 1** may arise, for example, due to bank and nonbank loans being issued in different amounts, at different dates, or with different interest rates. To investigate this possibility in more detail, **Table 1** regresses the prepayment indicator against a nonbank dummy and the loan interest rate, with fixed effects for year/month × GSE

Table 1 Prepayment

Variables	Ginnie Mae loans prepay24	GSE loans prepay24
Nonbank	0.0161***	0.0104***
	(0.000442)	(0.000331)
Loan interest rate	15.49***	12.06***
	(0.0686)	(0.0502)
Observations	2,262,186	4,606,484
R-squared	0.125	0.105
FICO/LTV bucket × year/month FE	Y	Y
Amount decile FE	Y	Y

The dependent variable equals 1 if the loan prepaid within 24 months of issue, and 0 otherwise. The independent variable `Nonbank` equals 1 if the lender is a nonbank institution, and 0 otherwise. FE are included for year/month × GSE-grid bucket and loan-amount decile. ***, **, and * indicate significance at the 1%, 5%, and 10% conventional levels.
Abbreviations: FE, fixed effect; GSE, government-sponsored enterprise; LTV, loan-to-value ratio.

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credit-score/LTV bucket[15] and for loan-amount decile. **Supplemental Table 1** runs the same regression for default. The regressions confirm what we saw in **Figure 1**. Nonbank-issued loans, both Ginnie Mae and GSE, are substantially more likely to prepay early than are bank-issued loans, with the difference being higher for Ginnie Mae loans. Ginnie Mae loans issued by nonbanks are also more likely to default early, although there is no significant difference in behavior for GSE loans.

In addition, **Supplemental Figure 3** shows the difference between prepayment behavior split by year of issue, showing that the pattern seen in **Figure 1** is repeated for loans issued in every year from 2005 to 2015, with the possible exception of 2012. The fact that we see these differences for every individual issue year seems to argue against the conclusions of Fuster et al. (2019), at least early in a loan's life. In particular, for loans issued in 2005, mortgage rates rose significantly over the next 2 years, so the nonbank borrowers who prepaid at faster rates were not doing so for interest rate reasons.[16] Finally, **Supplemental Figure 4** shows patterns for default rates that are similar to those for prepayment in **Figure 1**.

6. NONBANK LIQUIDITY AND CAPITAL

6.1. Mortgage Call Reports

It has historically been difficult to draw many firm conclusions about the financial position of nonbank lenders, because most of them are privately held, and so few data are available to researchers. However, under the Secure and Fair Enforcement for Mortgage Licensing (SAFE) Act of 2008, companies that hold a state license or state registration through the National MultiState Licensing System are required to file a Mortgage Call Report (MCR) with state regulators. The data include information on firms' balance sheets and on the mortgage applications that they receive. Fannie Mae or Freddie Mac seller/servicers and Ginnie Mae issuers are required to file quarterly. Other firms file balance-sheet information annually and mortgage application information quarterly. We have obtained these data and use them here to study the business models and financial positions of nonbank mortgage lenders.

We are the first to use the full universe of these data, obtained under Section 1512 of the SAFE Act, which permits data collected under the Act to be shared with state and federal regulatory officials with mortgage or financial services industry oversight authority.[17] We extract the MCR records corresponding to the 100 largest for-profit issuers of Ginnie Mae securities collateralized by forward mortgages, excluding banks, nonbanks that specialize in reverse mortgages, and entities chosen by their states to issue mortgage revenue bonds under the state's municipal bond allotment. These state-affiliated entities typically have a significant nonprofit component to their work as well as access to the municipal bond market. We also exclude the captive finance arms of manufactured-home builders since those lenders have access to cash from their parents. We select the 100 largest remaining firms.

We focus on Ginnie Mae issuers because, as described above, these nonbanks face and pose the most risk to the mortgage market. Specifically, these firms serve borrowers that are more likely

[15]The GSEs determine credit risk pricing via a fee that depends only on where the borrower sits in an 8 × 8 matrix of LTVs and credit scores termed Loan Level Price Adjustments (see Bartlett et al. 2022).

[16]Note that we expect some prepayment even when rates rise. For example, FHA borrowers may be able to refinance at the generally lower rates available in the GSE market once they have accumulated some equity.

[17]A subset of the MCR data was previously used in Jiang et al. (2020) and Jiang (2021); these authors obtained the data by filing Freedom of Information Act requests with state regulators. Our data are more recent and more complete, covering all states, the District of Columbia, and US territories.

to default, and the Ginnie Mae servicing contract implicitly requires the issuers to share in this risk. However, these firms also have significant involvement in the Fannie Mae and Freddie Mac markets. In total, firms in our sample held the MSRs on 75% of loans in Ginnie Mae pools and 39% of mortgages in Fannie Mae or Freddie Mac pools as of 2022:Q1. By way of comparison, nonbanks as a whole held the MSRs on 82% of loans in Ginnie Mae pools and 62% of loans in GSE pools in March 2022.[18]

We merge the MCR data for these firms with information on their servicing portfolios from eMBS. The eMBS data provide detailed information on the characteristics of the mortgages, including delinquency status. Our data run from 2015 to 2022:Q1.

6.2. Business Models

Nonbanks are more heterogeneous in their business models than has typically been recognized in the literature. This heterogeneity matters because different activities carry different risks. On the origination side, nonbanks can originate mortgages directly through retail channels or indirectly through brokers; they can also purchase mortgages originated and underwritten by other firms through correspondent channels. The retail channel is considered the least risky channel because the nonbank has the most direct information on the quality of the loan.

On the servicing side, nonbanks can choose to retain the servicing rights or sell them. If they retain the servicing rights, they book an MSR on their balance sheets. Holding the MSR means assuming the risks associated with its volatility, since its value can fluctuate dramatically with interest rates and mortgage delinquencies, and the responsibility of advancing payments on behalf of delinquent borrowers. The MSR holder also decides whether to hire a subservicer or to carry out itself the operational aspects of servicing, which involve operational and compliance risk.[19]

As examples of this wide range of business models, consider three of the largest publicly traded nonbanks. At Rocket (formerly Quicken), approximately two-thirds of its originations come from retail channels, and Rocket services the loans that it originates. United Wholesale Mortgage originates mortgages exclusively through brokers and contracts out its servicing to subservicers. New Residential acquires more than half of its originations from correspondent channels. It purchases MSRs from other firms as an investment opportunity and performs subservicing for more than 60 other entities through a subsidiary. Firms that purchase MSRs from other firms, like New Residential, are sometimes referred to as MSR aggregators.[20]

On average, large Ginnie Mae issuers perform a wider variety of activities and handle more types of mortgages.[21] They are more likely to acquire loans through retail, correspondent, and broker channels; to service their own loans and to subservice for others; and to sell loans to the GSEs as well as issue securitizations guaranteed by Ginnie Mae. Small issuers are more likely to hold only retail loans and less likely to service their own loans or subservice loans for others. However, small issuers tend to have riskier portfolios on two other dimensions: They are more likely to concentrate in loans funded by Ginnie Mae pools and in loans originated to borrowers with low credit scores. **Supplemental Table 2** breaks out these results.

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[18]Authors' calculation from data in Recursion, "Agency Mortgage Market Monthly Update," April 2022.
[19]Hiring a subservicer does not absolve the MSR holder of these risks because it is responsible for the actions of its counterparties.
[20]All information in this paragraph is drawn from the publicly available 2020 10-K filings of these firms.
[21]We assess issuer size by the unpaid principal balance of the loans for which the nonbank holds the servicing rights.

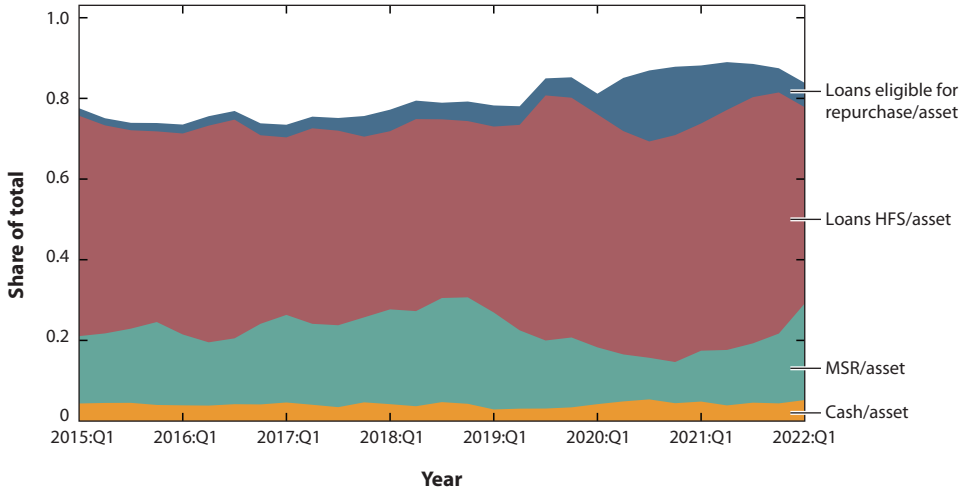

Figure 2

Nonbank asset composition. Abbreviations: loans HFS, loans held for sale; MSR, mortgage servicing right. From staff calculations based on data from the Conference of State Bank Supervisors, Nationwide MultiState Licensing System & Registry (**https://nationwidelicensingsystem.org/slr/common/mcr/Pages/default.aspx**).

As suggested by these results, the operational aspects of servicing are concentrated in a fairly small number of Ginnie Mae issuers. In total, only 38% of the issuers that hold the servicing rights on loans carry out the operational aspects of the servicing. On a mortgage-weighted basis, 62% of the mortgages in our sample are serviced by the firm that holds the servicing rights.

6.3. Balance Sheets

The balance sheet of a typical Ginnie Mae nonbank issuer consists almost entirely of cash and mortgage-related assets: mortgages held for sale, mortgages eligible for repurchase, and MSRs (**Figure 2**). Of the mortgage-related assets, only MSRs are potentially available for use to meet any unexpected obligations. Mortgages held for sale are the loans that are funded on warehouse lines of credit before securitization. These mortgages collateralize the lines and are not available for any other use. Mortgages eligible for repurchase represent an accounting concept pertaining to loans in Ginnie Mae pools that are 90 or more days delinquent. Since the servicer has the unilateral right to repurchase these loans out of the pool, for accounting purposes the servicer has to recognize these loans on the balance sheet. These assets also cannot be monetized for other purposes.[22]

MSRs are a low-quality asset. Their valuations can move dramatically with interest rates and mortgage delinquencies, and they can become illiquid in times of stress (see Bd. Gov. Fed. Res. Syst. et al. 2016, Kim et al. 2018, Hubbard et al. 2021). When MSR valuations decrease because of a rise in mortgage delinquencies, the rest of the nonbank's balance sheet will likely be stressed as well: Mortgages held for sale will fall in value, and the nonbank's cash will come under pressure from a drop in origination revenue and an increase in servicing costs. MSR valuations can also be

[22] Loans eligible for repurchase are not explicitly identified in the MCR data. Our comparisons of the "other assets" field in the MCR data with selected companies' 10-K filings suggest that other assets are a close proxy for loans eligible for repurchase.

hard to determine: Since MSRs trade infrequently, their valuations are determined using models and subjective assumptions.

As of 2022:Q1, the median ratio of cash to assets for the issuers in our sample was 7%, the median ratio of MSRs to assets was 20%, and the median ratio of mortgages held for sale to assets was 53%.[23] **Supplemental Table 3** shows these ratios for different sizes of nonbanks. However, these asset shares can shift substantially with macroeconomic conditions. When mortgage rates fell at the start of the COVID-19 pandemic, loans held for sale rose along with the surge in mortgage refinancing (**Figure 2**). MSR valuations dropped, both because the expected servicing income associated with existing loans fell when those loans became more likely to prepay and because servicers anticipated that the pandemic would lead to a rise in delinquencies. Meanwhile, as borrowers took advantage of forbearance programs, loans eligible for repurchase rose. When mortgage rates rose sharply in 2022:Q1, these trends reversed. MSRs surged as a share of assets, and loans held for sale dropped.

Supplemental Material >

The liability side of the nonbank balance sheet is almost entirely short-term debt, with the median ratio of short-term to total liabilities in our sample being 94%. This finding underscores the susceptibility of these firms to run risk. Some issuers have some long-term funding, presumably from facilities collateralized by MSRs: The tenth percentile of the ratio of short-term to total liabilities is 63% (**Supplemental Table 3**). Firms obtain credit from many lenders: The median number of lenders is 6 across all issuers, is 5 for smaller issuers, and is 13 for larger issuers. A larger number of lenders increases the diversification of funding sources but also heightens run risk, since it takes only one panicky lender to start a run.

6.4. Liquidity and Capital

Nonbanks need liquidity and capital to originate loans, to advance payments on behalf of defaulted borrowers, and to absorb credit losses. Ample capital may also signal that a nonbank has an ongoing commitment to the mortgage business and is able and willing to invest in, and exercise care with, origination and servicing.[24]

Determining whether nonbanks have enough capital and liquidity is difficult because there is no agreed-upon framework for answering this question. The metrics used for banks are unlikely to be appropriate for nonbanks. Unlike banks, nonbanks do not have access to liquidity from the Federal Reserve System or the Federal Home Loan Banks, and as monolines, nonbanks are more susceptible than banks to certain macroeconomic shocks. However, unlike banks, nonbanks do not have a claim on government-provided deposit insurance. Banks may need stronger regulation because the presence of the insurance may cause private market participants to monitor bank risk taking less carefully.

We gauge liquidity by assessing an issuer's cash relative to its quarterly expenses. The issuer at the median of the distribution in 2022:Q1 had enough cash to cover one quarter's worth of expenses (**Supplemental Table 4**). However, some issuers, as indicated by the tenth percentile numbers, had enough cash to cover only a month or so of expenses. Larger issuers held more cash: The median cash relative to expenses weighted by servicing unpaid principal balance (UPB) was more than 4 months.

Before the pandemic, though, as shown in **Figure 3**, issuers had substantially less cash relative to their expenses, with the median cash at approximately half a quarter's expenses from 2015 to

[23] Cash includes cash equivalents such as commercial paper.

[24] Securitization issuers provide representations and warranties regarding the quality of their originations. These have value only if the issuer is financially viable, so the firm's balance sheet is important for performance.

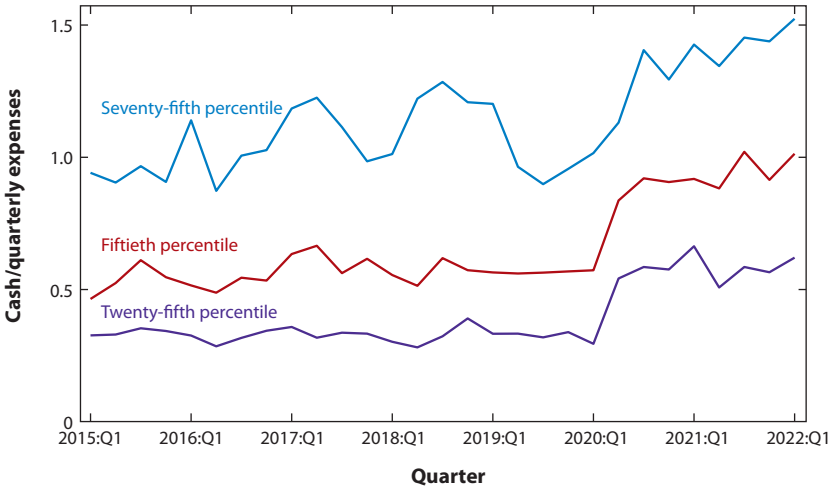

Figure 3

Percentiles of cash relative to quarterly expenses. From authors' calculations based on data from the Conference of State Bank Supervisors, Nationwide MultiState Licensing System & Registry (**https://nationwidelicensingsystem.org/slr/common/mcr/Pages/default.aspx**).

2019. The increase in cash during the pandemic was widespread across issuers, as indicated by the increases at the twenty-fifth and seventy-fifth percentiles, and likely stems from the high gain-on-sale profits that originators made from mortgage refinancings during the pandemic (Fuster et al. 2021).

We assess nonbank capital relative to three benchmarks: the Ginnie Mae leverage ratio in effect as of June 2022, a risk-based capital ratio proposed by Ginnie Mae in July 2021, and the bank Tier 1 capital ratio in effect as of June 2022. Although the bank standards are unlikely to be the right ones for nonbanks, they provide a way to compare the capital positions of banks and nonbanks.[25]

The three capital measures gauge the nonbank's equity relative to its assets. The substantive difference across the measures is how much credit they give nonbanks for their MSR holdings. In Ginnie Mae's existing leverage ratio, equity must be 6% or more of total assets. MSRs are treated equivalently to other assets in this calculation. In the bank and the proposed Ginnie Mae risk-based capital measures, MSR holdings are penalized in the calculation of both equity and assets. MSRs above a certain threshold must be subtracted from equity; the threshold is lower (and thus more punitive) for the bank measure than for the Ginnie Mae measure. Meanwhile, assets are risk weighted, and MSRs have a high weight. Ginnie Mae's proposal would require a nonbank to maintain a risk-weighted capital ratio greater than 10%, whereas a bank must have a tier 1 risk-based capital ratio greater than 8% to be considered well capitalized. The measures are described in detail in **Supplemental Table 5**. As also described in the **Supplemental Material**, our measures are approximations of the actual concepts because of data limitations.

Supplemental Material >

We find that the typical Ginnie Mae issuer is reasonably well capitalized. **Figure 4** shows that the median of all three capital ratios remained well above the relevant regulatory thresholds

[25]The Ginnie Mae leverage ratio requirement can be found in Ginnie Mae (2022), chapter 3. The proposed standards can be found in Ginnie Mae (2021). The bank standards can be found in the Federal Reserve Board's Regulation Q, 12 C.F.R. part 217.

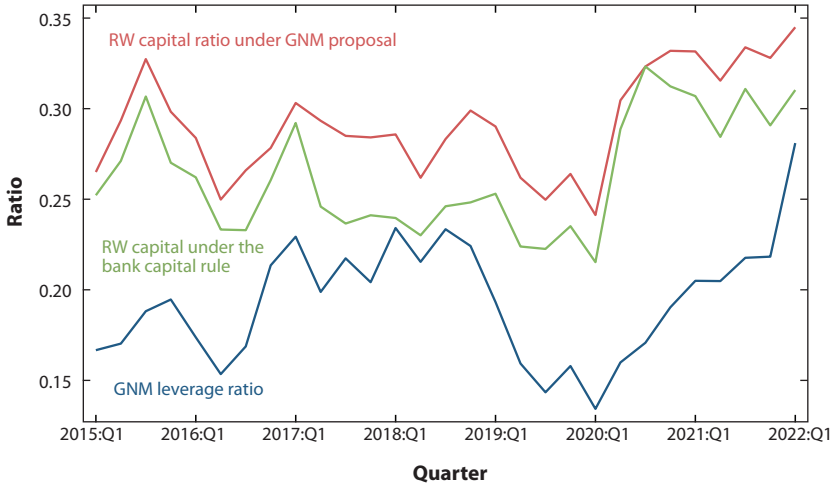

Figure 4

Median capital ratio under different rules. Abbreviations: GNM, Ginnie Mae; RW, risk weighted. From authors' calculations based on data from the Conference of State Bank Supervisors, Nationwide MultiState Licensing System & Registry (**https://nationwidelicensingsystem.org/slr/common/mcr/Pages/default.aspx**).

throughout the time period. The medians rose significantly after the onset of the pandemic, presumably because of the cash generated by the heightened mortgage refinancing. In aggregate, we also find, as did Jiang et al. (2020), that the Ginnie Mae issuers in our sample have approximately the same capital as banks that concentrate in mortgage lending. As of 2022:Q1, the aggregate tier 1 risk-based capital ratio was 24.7 for banks that concentrate in mortgages and 25.2 for our Ginnie Mae issuers as a whole.[26]

However, this finding in the aggregate masks variation across issuers and time. As we show next, issuers' capital positions look less favorable when evaluated on a risk-weighted basis. They also look less favorable at times when mortgage rates are relatively high and mortgage refinancing activity is muted. At these times, as shown above in **Figure 2**, MSRs are a higher share of assets.

Almost all issuers look to be in good condition when gauged by Ginnie Mae's current leverage ratio. **Figure 5*a*** shows the number of issuers in each quarter with inadequate capital under each of our measures, and **Figure 5*b*** shows the UPB of the mortgages on which these issuers hold the servicing rights. Almost no issuers fell below Ginnie Mae's minimum leverage ratio throughout the 2015–2022:Q1 period. In 2022:Q1, the tenth percentile of the leverage ratio was approximately 16% (**Supplemental Table 4**), compared with the required minimum of 6%, and only two firms had a value below the threshold.

Supplemental Material >

Ginnie Mae issuers look less consistently well capitalized when risk-weighted measures are applied, particularly in 2018 and 2019. In 2018:Q4, 14% of issuers had risk-weighted capital ratios below the proposed Ginnie Mae threshold of 10%, and 24% of issuers had risk-weighted capital ratios below the bank Tier 1 threshold of 8%. These issuers held the servicing rights on fairly large mortgage portfolios. In 2018:Q4, the MSRs on 25% of mortgages in Ginnie Mae pools were held by issuers with risk-weighted capital ratios below the Ginnie Mae threshold, and 41% were held by issuers with risk-weighted capital ratios below the bank threshold.

[26]The capital ratio for banks is from table IV-A of FDIC (2022).

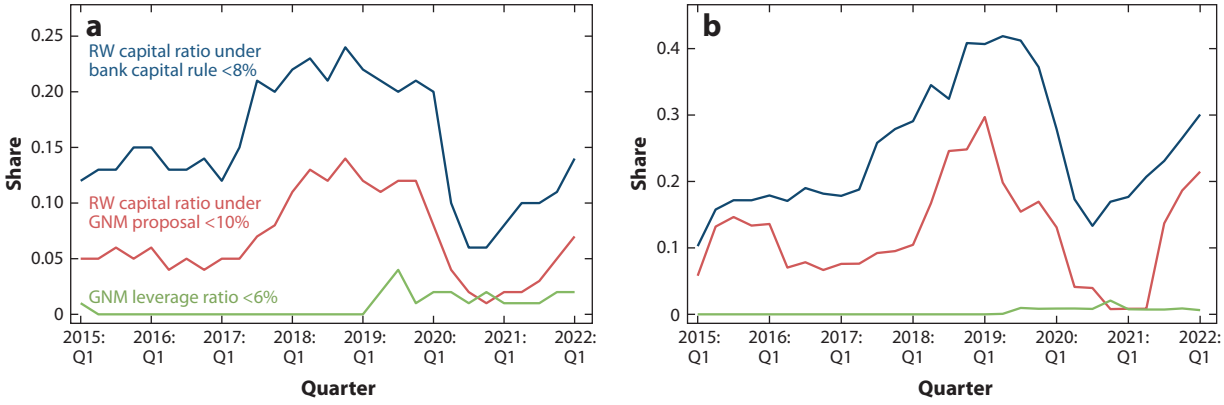

Figure 5

Share of nonbanks with binding capital rules. (*a*) Equal weighted. (*b*) Weighted by Ginnie Mae servicing unpaid principal balance. Abbreviations: GNM, Ginnie Mae; RW, risk weighted. From authors' calculations based on data from the Conference of State Bank Supervisors, Nationwide MultiState Licensing System & Registry (**https://nationwidelicensingsystem.org/slr/common/mcr/Pages/default.aspx**).

Supplemental Material >

In 2022:Q1, when refinancing ebbed and MSR valuations rose, the risk-weighted capital position of Ginnie Mae issuers eroded relative to 2020 and 2021. The tenth percentile of the Ginnie Mae proposed risk-based capital ratio was 16% weighted equally across firms and 3% weighted by UPB (**Supplemental Table 4**), and seven firms had values below the threshold. These firms held the servicing rights on 21% of loans in Ginnie Mae pools. The tenth percentile using the bank Tier 1 ratio was 4% in 2022:Q1, weighted equally across firms, and zero when weighted by UPB. Fourteen firms, representing approximately 30% of UPB of mortgages held in Ginnie Mae pools, would fail this standard in 2022:Q1. In contrast, small firms generally appeared well capitalized, with a tenth percentile for the bank Tier 1 measure of 16%, presumably because they are less involved in mortgage servicing and thus hold fewer MSRs.

Our finding that some Ginnie Mae issuers are less well capitalized than banks, as gauged by the nontrivial share that do not meet the Tier 1 capital ratio in some time periods, is consistent with the predictions of our model that nonbanks choose lower capital ratios when their portfolios consist of intermediate-score borrowers and that the probability of failure is higher for nonbanks than banks. Our findings are also consistent with Jiang et al. (2020), who find that nonbank leverage is considerably more dispersed than that of banks.

In **Supplemental Table 6**, we look at the characteristics of issuers with risk-weighted capital in 2018:Q4 below the proposed Ginnie Mae threshold. As suggested by the above results, they tended to be larger issuers with high MSR holdings and a business model that emphasized purchasing MSRs from other firms. On average, below-threshold issuers held the servicing rights on a portfolio with a UPB of $79 billion, compared with $16 billion for above-threshold issuers. Below-threshold issuers had an average MSR-to-asset ratio of 49%, compared with 15% for above-threshold issuers. On average, below-threshold issuers purchased MSRs in 2017 and 2018 totaling 25% of their 2016:Q4 assets, compared with 4% for above-threshold issuers. Below-threshold issuers also held less cash than above-threshold issuers: The average cash-to-asset ratio for these issuers was 5%, compared with 7% for above-threshold issuers.

The below-threshold issuers also played an important role in the operational aspects of servicing. Approximately 55% of below-threshold issuers serviced their own loans and 43% subserviced for others, while only 28% percent of above-threshold issuers serviced their own loans and 15% subserviced for others. In total, the 14 below-threshold issuers handled the

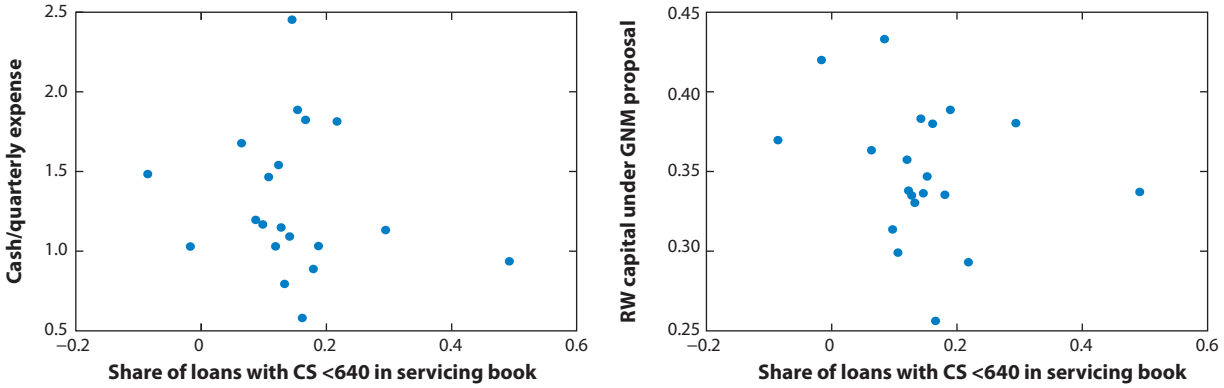

Figure 6

Liquidity and capital by share of servicing portfolio with low CS. (*a*) Cash/quarterly expense. (*b*) RW capital ratio under GNM proposal. Abbreviations: CS, credit score; GNM, Ginnie Mae; RW, risk weighted. Data are for 2022:Q1. From authors' calculations based on data from the Conference of State Bank Supervisors, Nationwide MultiState Licensing System & Registry (**https://nationwidelicensingsystem.org/slr/common/mcr/Pages/default.aspx**) and eMBS, Inc.

subservicing operations for more than $500 billion in mortgages, while the other 86 issuers handled the subservicing operations on approximately $150 billion in mortgages.

Finally, we explore whether firms that face more potential strains on their capital and liquidity are provisioning accordingly. We measure potential strain with the share of a firm's total servicing portfolio that is mortgages with credit scores at origination below 640. These loans are more likely to default, and so nonbanks have the liquidity exposure of funding servicing advances and the capital exposure of absorbing losses not covered by the FHA and VA insurance.

As shown in **Figure 6**, there is no apparent relationship between the concentration of a nonbank's portfolio in low-credit-score loans and its liquidity or capital. Perhaps this lack of relationship is not surprising, as Ginnie Mae does not require its servicers to hold more liquidity and capital for lower-score loans, even though its servicing contract implies that these loans pose more costs. The industry convention apparently is not to hold more liquidity or capital either.

SUMMARY POINTS

1. Nonbank lenders have become dominant in the mortgage market. They originated approximately 60% of mortgages in 2020 and approximately 90% of the mortgages funded by Ginnie Mae securitizations; these mortgages tend to be originated to borrowers with lower credit scores.
2. Much of the existing securitization literature is more relevant to bank than to nonbank lenders. We build a simple theoretical model of bank versus nonbank mortgage lending, which predicts that mortgages originated by nonbank lenders are more likely to prepay and default and that nonbank lenders themselves are more likely to go out of business than bank lenders.
3. We find significant differences in prepayment behavior between bank and nonbank loans. Using merged data from HMDA, ATTOM, and McDash, we find that nonbank loans are more likely to prepay early than bank loans, and this is not just due to nonbank borrowers prepaying more rationally.

4. Nonbank assets are concentrated in mortgage-related holdings that are likely to all perform poorly if mortgage defaults rise. The main unencumbered asset of nonbanks, MSRs, can be particularly illiquid in times of stress.
5. On average, nonbank Ginnie Mae issuers had stronger liquidity and capital positions in 2022:Q1 than prepandemic, thanks largely to elevated profits from mortgage refinancing.
6. Some issuers that play an outsized role in mortgage servicing have low capital when measured on a risk-weighted basis. These capital positions call into question these issuers' ability to absorb the servicing losses that they are responsible for under the Ginnie Mae contract when defaults rise.

FUTURE ISSUES

1. Obtaining data is very difficult. Most loan and lender-level mortgage data are proprietary and subject to significant limitations on access and completeness. These data limitations apply especially for non–publicly traded nonbank lenders, for whom balance-sheet data can be accessed only under Section 1512 of the SAFE Act or via Freedom of Information Act requests to a subset of cooperating state regulators (see Jiang 2021). Even these balance-sheet data have very little information on the basic terms of the debt facilities extended to nonbanks, let alone information on the assets that collateralize the facilities or the covenants that determine the conditions under which the facilities can be canceled.
2. The relationship between MSRs and household access to mortgage credit is not well understood. Securitization separates a loan from the right to service it and, in the process, creates an asset—MSRs—that is an appealing investment opportunity to some market participants such as real estate investment trusts, in part because its valuation rises with interest rates. Other market participants purchase MSRs to gain information about which borrowers can be profitably refinanced. Very little is known in the academic literature about how changes in the valuation and liquidity of these assets affect household access to mortgage credit.
3. The appropriate capital framework for nonbank servicers is unclear. MSRs are a lower-quality asset than cash, yet the existing nonbank regulatory infrastructure treats the two assets equivalently for capital purposes. Accounting for the quality of capital, such as with appropriate risk weights, would provide a better gauge of the firms' resources under strain, which is crucial given the systemic importance of these firms in the operational aspects of servicing. Requiring these firms to hold more capital might also affect MSR liquidity, MSR pricing, and access to credit, so regulators would need to calibrate carefully to balance these objectives.
4. There is a disconnect between the Ginnie Mae servicing contract—which imposes greater risk and cost on issuers with larger portfolios of low-credit-quality loans—and the Ginnie Mae capital requirements—which do not require these firms to hold more capital. The creditors of nonbanks may put capital restrictions on nonbanks that vary with the portfolio credit quality, but as noted above, the covenants on these facilities are not observed by researchers or even many regulators. However, we see no evidence in

the data that issuers with more exposure to low-credit-quality loans are holding more liquidity or capital.

5. How to carry out more effective regulatory oversight of mortgage nonbanks remains an open question. The turbulence in the mortgage-funding markets in March 2020 has reignited discussion about the need for regulatory oversight of nonbank mortgage lenders and the risks to financial stability arising from macroeconomic shocks to their short-term funding model. Yet there is no agreement about what the appropriate regulatory framework for nonbanks should look like or how, for example, to carry out meaningful stress tests.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

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