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金融危機與資產證券化對銀行抵押放款核貸率之影響

Impact of the Financial Crisis and Asset Securitization on Banks' Mortgage Loan Approval Rates

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摘要

本文旨在研究資產證券化與 2008 金融危機對銀行抵押放款核貸率之影響。資產證券化過往被詬病為利於銀行高槓桿經營、提前認列損益與進行表外融資之工具，導致銀行於借款審核過程產生放水之疑慮，進而促使金融危機之發生。另一方面，美國主管機關自 2010 起陸續要求金融業者應遵守更加嚴格之資本規範、更健全之授信流程與全面揭露資產證券化相關交易。因此，本研究以 2004 年至 2017 年美國金融控股公司為研究對象，配合美國房屋抵押貸款揭露法之資料，探討：一、資產證券化與金融危機本身對銀行抵押放款核貸率之影響；二、金融危機衍生之相關法規修正是否對資產證券化與銀行抵押放款核貸率間之關係帶來變化；並分別就整體貸款、高風險貸款與非高風險貸款核貸率作為信用風險面向之考量。實證結果顯示，資產證券化與金融危機本身對銀行貸款核貸率有負向影響，而資產證券化於金融危機後對銀行貸款核貸率則有顯著正向增額效果。我們認為，金融危機後之制度重整確實對於整體金融市場之放款行為產生正向效益。其中，未涉及資產證券化之金控公司在法規環境改變後，高風險放款行為確實顯著減少；相較之下，涉及資產證券化之金控公司則因信用增強機制之聲譽壓力，致使其放款行為維持在較為嚴格之水準。

關鍵字：美國房屋抵押貸款揭露法、抵押借款、放款行為、資產證券化、金融危機

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Abstract

This study examines (1) the impact of securitization and the 2008 financial crisis on banks' mortgage loan approval rates, and (2) how the 2008 financial crisis and subsequent regulation establishments or amendments affected the relationship between securitization and banks' mortgage loan approval rates. Using Home Mortgage Disclosure Act data ranging from 2004 to 2017, we find that banks' mortgage lending behavior is more restricted in terms of approval rates after the crisis than before the crisis. We also find that securitization had a negative effect on banks' mortgage loan approval rates before the crisis, but a significantly positive incremental effect after the crisis. Our results suggest that legislation revisions after the financial crisis enhance the accountability of banks' lending behaviors, and these revisions had more influence on banks without securitization than banks with securitization since banks with securitization had already applied strict approval standards for reputation concerns before the financial crisis.

Keywords: HMDA, mortgage loans, lending behaviors, securitization, financial crisis

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1. Introduction

Securitization plays an important role in the U.S. economy and can be dated back to the 1970s when U.S. governments applied this instrument to solve the problem of exploding demand for housing credits (Lengwiler, 2016). In contrast, variable financial assets have become securitization targets for commercial banks nowadays since securitization enables banks to offer loans with higher leverages and to recognize profits in advance (Minton, Sanders, and Strahan, 2004; Dechow, Myers, and Shakespeare, 2010). As a result, some argue the excessive securitization eventually caused the 2008 financial crisis (Levitin, Pavlov, and Wachter, 2009; Deku, Kara, and Zhou, 2019).

Several regulations were amended after the financial crisis to correct the vulnerable disciplines in the financial industry. The most important regulatory reform was probably the Dodd-Frank Wall Street Reform and Consumer Protection Act (the Dodd-Frank Act), which was enacted in 2010 to enhance accountability and transparency in the financial system. Among many other things, the Dodd-Frank Act improved the securitization process and protected consumers against abuses related to mortgages. Besides, FASB issued FAS 166 and FAS 167 in 2009, requiring banks to consolidate securitization entities following the control-based approach rather than the quantitative approach used in the pre-crisis period. This revision forced banks to completely disclose the securitization that used to be untransparent before. Additionally, BCBS issued Basel III in 2010, with more restrictive requirements related to capital, liquidity, and leverage. The U.S. Federal Reserve released capital requirements based on Basel III in 2013.

Prior research (Allen and Gale, 1994; Tufano, 2003; Duffie, 2008) finds that the originate-to-distribute (OTD) model used in securitization process transfers banks' credit risks to the entire market. Since the OTD model allows banks to benefit as originating institutions while

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avoiding specific credit risks simultaneously, banks that take part in securitization screen their borrowers less carefully (Parlour and Plantin, 2008; Purnanandam, 2010). However, some research findings suggest that securitization does not affect banks' lending behaviors. Kara, Marques-Ibanez, and Ongena (2019) find that during the securitization process, banks indeed choose loans averagely rather than selecting and securitizing loans with lower credit qualities.

Prior research findings also suggest that banks' reputations are related to the securitization process and affect banks' lending behaviors. Ambrose, LaCour-Little, and Sanders (2005) find banks keep riskier loans rather than securitizing them due to both regulatory capital incentives and concerns for reputations. Albertazzi, Eramo, Gambacorta, and Salleo (2011) show that banks engaged in securitization not only sell fewer risky loans and retain part of the securities, but also build up reputations by maintaining approval standards constantly.

We use the Home Mortgage Disclosure Act (HMDA) database to collect loan-level residential mortgage loan application data from 2004 to 2017 and examine (1) how securitization and the financial crisis affect banks' mortgage loan approvals, and (2) how the financial crisis and subsequent regulation amendments impact the relationship between securitization and banks' mortgage loan approvals. We do not include data between 2018 and 2019 in our sample since reporting of open-end LOCs (Line of Credits) has become mandatory starting from 2018.

We find that U.S. BHCs without securitization had higher total approval rates than U.S. BHCs with securitization before the financial crisis, and the difference in the lending behaviors between these two groups of U.S. BHCs was caused by the difference in high-risk loan approval rates. In the pre-crisis period, U.S. BHCs without securitization approve more high-risk compared to the other BHCs, but this circumstance was later mitigated after the

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financial crisis, as we see that two groups of U.S. BHCs had approximately the same approval rates in the post-crisis period regardless of risk levels of loans. We also find that all the BHCs experienced dramatic decreases in mortgage approval rates after the financial crisis. Similar results are observed when we define U.S. BHCs with securitization as banks with securitized assets made of loans secured by only real estate. In other words, both securitization and the financial crisis had negative effects on total and high-risk mortgage loan approval rates, while securitization had a significantly positive incremental after the crisis. Our results imply that (1) after the crisis, banks approved mortgage loan applications with more caution than they did before the crisis, and (2) BHCs with securitization already screened loan applications carefully for reputation concerns before the financial crisis, therefore, regulation amendments after the financial crisis had more effect in rectifying BHCs without securitization.

This study contributes to the literature related to securitization, the financial crisis, and mortgage lending behaviors. Our study uses HMDA data to investigate how reputation incentives and conversion in legislation environment have impacted the effects of securitization on the U.S. bank mortgage lending market, and finds that reputation consideration forces banks with securitization to approve loan applications carefully, while regulation revisions make banks without securitization approve mortgage loans, especially the high-risk mortgage loans, with more caution after the financial crisis.

The remainder of this paper is organized as follows. Section 2 describes the regulatory background, reviews the literature, and develops the hypotheses. Section 3 describes the data and the methodology. The empirical results are discussed in Section 4. After all, we have our conclusions in Section 5.

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2. Background, Literature Review, and Hypothesis Development

2.1 Background

2.1.1 Asset Securitization

Asset securitization is a structured process that enables financial institutions to repackage and sell financial assets (Breidenbach, 2005). Traditionally, banks hold loans to maturities and bear direct obligations since loans were mainly funded by deposits. After World War II, since depository institutions could no longer afford the increasing demand for housing credits, securitization was developed to enhance the liquidity in the mortgage loan market, resulting in banks with more cashflows for lending purposes (Kendall and Fishman, 1999).

Nevertheless, some argued asset securitization played an important role in the 2008 financial crisis (Levitin et al., 2009; Deku et al., 2019). Asset securitization is criticized for allowing banks to transfer credit risks to the third parties (Parlour and Plantin, 2008; Purnanandam, 2010). Also, the originate-to-distribute model used by asset securitization enables the financial institutions to lower the borrowing costs, release additional capital, operate with higher leverage, remove assets from balance sheets, and improve the credit risk management (Minton et al., 2004; Dechow et al., 2010). Thus, regulations regarding asset securitization have been revised several times to maintain the stability of the market.

Asset securitization could refer to the securitization of two different kinds of assets, the financial assets and the real estate (Brueggeman and Fisher, 1993; Breidenbach, 2005). In general, asset securitization describes how financial institutions transfer the assets with cash inflow into securities for sale. Thus, the terms “securitization” and “asset securitization” in our research refer to only financial asset securitization. Securities generated from financial asset securitization could be split into two types, mortgage-backed security (MBS) and asset-

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backed security (ABS). MBS refers to the securitization of home mortgage loans, while ABS refers to the securitization of all the other loans, such as credit card receivables, auto loans, commercial and industrial loans, and leases (Kendall and Fishman, 1999; Breidenbach, 2005). For the following part of our research, the term "total asset securitization" includes both MBS and ABS, while the term "real estate secured asset securitization" refers to only MBS.

2.1.2 Regulation Amendments after the 2008 Financial Crisis

Before the 2008 financial crisis, banks treat securitization as normal sales of assets and recognize only retained part of securitized assets on balance sheets. Also, banks structured the securitization entities to meet certain criteria specified in FAS 140 and FIN 46(R), which exempted banks from consolidating these entities (e.g., qualifying special purpose entities, QSPEs or non-QSPEs). As a result, a bank before the 2008 financial crisis could bear credit risks of assets held by its securitization entities (i.e., QSPEs and non-QSPEs) while reporting only its financial position. The problem of misleading financial reports due to unconsolidated securitization entities was revealed during the 2008 financial crisis period. Thus, FASB issued FAS 166 and FAS 167 in 2009, requiring banks to consolidate their securitization entities following the control-based and qualitative approaches rather than the quantitative approach before.

On the other hand, the Dodd-Frank Wall Street Reform and Consumer Protection Act (the Dodd-Frank Act) was enacted in 2010 to enhance accountability and transparency in the financial system. The major purposes of the Dodd-Frank Act include improving the securitization process and protecting consumers against abuses related to mortgages, with complete regulations in Title IX and Title XIV of the Dodd-Frank Act, respectively. The most important regulation related to the securitization process is that the law required credit

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risk retention and defined “qualified residential mortgages” with restrictive down-payment and debt-to-income requirements. While for regulations related to mortgage, the Dodd-Frank Act focused on standardizing data collection for underwriting and imposed obligations on mortgage originators to lend to only borrowers who are likely to repay their loans.

Meanwhile, the Basel Committee on Banking Supervision (BCBS) issued Basel III in 2010. The main amendments in Basel III include restrictive classification of tier 1 capital, increased scopes of risk assets, capital conservation buffer and counter capital buffer, grading of global systemically important banks (G-SIBs), and ratios regarding liquidity, stable funding, and leverage. Based on the structure of Basel III, the U.S. Federal Reserve released modified capital requirements in 2013. Moreover, banks with assets over $10 billion have been required to implement a Dodd-Frank Act Stress Test (DFAST) at least annually under the supervision of FED since 2014.

2.1.3 Home Mortgage Disclosure Act (HMDA)

Home Mortgage Disclosure Act (HMDA) was enacted by U.S. Congress in 1975 and was implemented by the Federal Reserve Board's Regulation C, requiring financial institutions to provide mortgage data to the public. In 2011, the rule-writing authority of HMDA was transferred from the Federal Reserve to the Customer Financial Protection Bureau by the Dodd-Frank Act. The first purpose of HMDA is to provide information for residents to know whether the local financial institutions offer housing credit services. Second, HMDA enables public officials to target their investments across different locations. Finally, since HMDA requires the collection of data from both applicants and borrowers, this characteristic-related information is useful in identifying possible discriminatory lending behaviors and enforcing anti-discrimination strategies.

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2.2 Literature Review

Prior literature describes the importance of securitization in the economy. Pozsar, Adrian, Ashcraft, and Boesky (2010) find that the shadow banking system, one of the critical mechanisms of securitization, includes huge attendance of government-sponsored enterprises (GSEs). Rosen (2011) finds that mortgages are usually sold by regular banks to institutions in the shadow system first, then the institutions will securitize these mortgages for selling purposes. As a result, most of the economic risk is transferred to the shadow system during the transactions.

Since lending makes up banks' core business traditionally, banks apply several approaches to screen borrowers to avoid adverse selection or moral hazard. Nevertheless, banks do not utilize these approaches completely due to several reasons such as legislation limitations or market incompleteness. Stein (1998) finds that frictions in raising additional capital often result in banks not lending up at the best level. Since financial institutions are highly supervised by governments with numerous regulations, securitization emerged as the solution for this circumstance. Compared to the originate-to-hold (OTH) model used by traditional lending, the originate-to-distribute (OTD) model applied by securitization enables banks to sell loans instead of holding to maturities. This innovation helps the original institutions to diversify their own risk by sharing it with the entire market, resulting in a more controllable risk environment for management (Allen and Gale, 1994; Tufano, 2003; Duffie, 2008). Jiangli, Pritsker, and Raupach (2007) find that banks prefer securitization to debts, equities, or simple loan sales when having such opportunities. Also, they find banks that participate in securitization activities experience higher profitability and achieve high leverage or low insolvency risk.

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On the other hand, the relation between securitization and lending has been frequently discussed. Parlour and Plantin (2008) and Purnanandam (2010) find that since the OTD model allows banks to benefit as originating institutions by transferring the credit risk to outsiders, banks that deeply involved in the OTD market monitor their borrowers with less caution due to the lack of incentives. Similar results are found by Rajan, Seru, and Vig (2015) with an explanation that banks' incentives to collect borrowers' soft measures decrease because the distance between the originating institutions and the ultimate credit risk receivers increases. Wang and Xia (2015) find that banks active in securitization apply looser covenants on their borrowers and are more likely to grant waivers while keeping the same loan terms. These results suggest that banks make less effort on monitoring after engaging in securitization.

Furthermore, some argue whether banks securitized low-quality loans deliberately. Gennaioli, Shleifer, and Vishny (2012) find that banks retain systematic risk while diversifying idiosyncratic risk after securitization, and that securitization market is fragile because investors neglect certain unlikely tail risks. Frame (2017) uses the HMDA database and finds that securitization itself is not a problem, but the origination and distribution process of risky loans lead to the financial market weakness. It is further found that observable risky loans perform better if issued by securitization entities with reputational capital. Meanwhile, researches in Europe provide results from different points of view. Accornero, Alessandri, Carpinelli, and Sorrentino (2017) find that banks' lending decisions are not affected by the ratio of non-performing loans after controlling the firm-related factors. Kara et al. (2019) find that banks do not choose and securitize loans with lower credit quality, but borrowers whose loans are securitized perform worse than borrowers whose loans are not securitized after securitization. They believe that banks lost incentives to maintain the

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monitoring process for borrowers of securitized loans since the credit risk is already transferred to outsiders.

2.3 Hypothesis Development

Among all the stages in the securitization process, credit enhancement mechanisms are considered the most important procedures, which enable banks to sell packaged securities at satisfying prices and maintain stable cash inflows from third parties sustainably. Tranche, one of the credit enhancement mechanisms, allow banks to signal the quality of securities by keeping the assets with higher credit risk while selling assets with lower credit risk simultaneously. The key of the tranche is that if the residual risk of each asset is not highly correlated, then banks could diversify the credit risk through pooling these assets and further splitting them (DeMarzo, 2005). In case of defaults on high-risk loans retained by themselves, banks with securitization must ensure that loans, especially the high-risk loans, are carefully examined during the application process. Ghent and Valkanov (2015) also find that risk diversification is a key motivation for banks to engage in securitizations and that loans followed by substantial monitoring are less possibly to be securitized.

Prior researches also find that credit enhancement mechanisms are related to banks' reputations. Ambrose et al. (2005) examine whether lenders exploit asymmetric information through securitizing riskier loans or retaining riskier loans as traditional assets, and find that securitized mortgage loans experienced lower defaults than those retained in banks' portfolios, with evidence that banks are motivated by both regulatory capital incentives and concerns for reputations. Albertazzi et al. (2011) find that banks participated in securitization eliminate the negative effects of asymmetric information by selling fewer opaque loans while retaining part of the tranche equities, and that banks build up reputations by not undermining

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their original approval standards. Deku, Kara, and Marques-Ibanez (2019) find that mortgage-backed securities sold by reputable issuers are collateralized by higher quality asset pools which have lower delinquency rates and are less likely to be downgraded, implying reputation as a self-disciplining mechanism overall. In other words, we believe that the credit enhancement mechanisms stimulate banks with securitization to screen loan applications with more caution to maintain their reputations, resulting in lower loan approval rates compared to the other banks.

To examine whether banks with securitization screen loan applications more carefully, we need measurements for such approval activities. Nevertheless, activities in the loan market could fluctuate with the economic cycle, therefore, we have to distinguish the loan supply from the loan demand first. Fortunately, decision data of whether to approve or to deny loan-level residential mortgage loan applications is mentioned by prior literature to be a possible measure (Munnell, Tootell, Browne, and McEneaney, 1996; Loutskina and Strahan, 2009), and this data is available in the Home Mortgage Disclosure Act (HMDA) database. Hence, after considering the reputation incentives from credit enhancement mechanisms, our first hypothesis is as follows:

H1: Asset securitization had a negative effect on mortgage loan approval.

On the other hand, securitization is often criticized as one of the causes leading the 2008 financial crisis (Levitin et al., 2009; Deku et al., 2019). Hence, several regulations related to securitization are established after the financial crisis to enhance the supervision power on financial institutions and to prevent investors from risky investments. FASB issued FAS 166 and FAS 167 after the financial crisis, requiring banks to disclose complete information of securitization regardless of the entity structures. Dou, Ryan, and Xie (2018) find that after the implementations of revised FASs, the higher the securitization assets held by

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consolidation entities of a bank, the larger the decrease on mortgage approval rate will a bank experience. Dell'Ariccia, Igan, and Laeven (2012) find that before the financial crisis, the denial rates were lower in areas where the credit demand increased faster and banks weighted less on the loan-to-income ratios. They give the result that banks which involved more in securitization activities relax their lending standard more aggressively in the pre-crisis period. Taking the effect of changes in the regulatory environment into consideration, we believe that lending behaviors in the post-crisis period should be more careful, therefore, we have our second hypothesis as follows:

H2: Mortgage loan approval by bank holding companies (BHCs) decreased from before to after the crisis.

Furthermore, we argue that banks with securitization would steadily screen applications carefully to maintain their reputations, while banks without securitization would perform looser lending behaviors before the financial crisis and rebuild approval processes thoroughly as required by the regulations after the financial crisis. In other words, we predict that regulation amendments after the financial crisis should be more harmful to banks without securitization. Hence, our third hypothesis is as follows:

H3: After the financial crisis, asset securitization had a positive incremental effect on mortgage loan approval.

As mentioned previously, the term "asset securitization" in our hypotheses could refer to either "total asset securitization" or "real estate secured asset securitization". Therefore, for each of the hypotheses in our research, we first estimate the results using "total asset securitization" as the independent variable. Nevertheless, since we evaluate banks' lending behaviors through the data of loan-level residential mortgage loan applications from the HMDA database, we would like to further investigate the relationship between the approval

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rates of home mortgage loans and securitization of the same type of loans. Therefore, we then focus on only banks with "real estate secured asset securitization" as the treatment group and test each hypothesis subsequently.

3. Data and Research Methodology

3.1 Data

To examine whether securitization has different effects on mortgage loan lending behavior in the post-crisis period compared to in the pre-crisis period, we collect loan-level data from HMDA. Since the amendments of regulation C - a revised rule forcing financial institutions to submit loan-level data in a more standardized form - became effective in 2004, we collect U.S. BHCs data starting from the same year. On the other hand, although we try to maximize our research period by having data ranging from 2004 to 2019, the latest data we finally decide to use ends in 2017. We drop the 2018 and 2019 data because of "the 2015 HMDA rule" modification, which took effect on January 1, 2018 and affected data to be collected starting in 2018. The 2015 HMDA rule modification made reporting of open-end LOCs from optional to mandatory. Therefore, we have U.S. BHCs data retrieved from 2004 to 2017 to avoid the inconsistency of open-end LOCs after 2018.

To limit the sample to only parent holding companies, we first match all U.S. BHCs between 2004 and 2017 from the Bank Regulator data set with those of the Center for Research in Security (CRSP) data set base on the CRSP-FRB Link provided by the Federal Reserve Bank (FRB) of New York, resulting 1,167 BHCs in this step. We then delete BHCs with a non-December year-end, BHCs with data less than a complete year, and observations missing basic financial data, and we obtain 617 BHCs for the period 2004-2017. Next, for each of the 617 BHCs in our research period, we select the subsidiary with the largest size of

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total assets as a major subsidiary, and then merge the selected 617 subsidiaries of the BHCs with HMDA loan-level data. After deleting BHCs which cannot be matched with the HMDA data and BHCs missing partial HMDA data value, we finally obtain a sample of 4,264 observations for 550 BHCs. In addition, we obtain data of growth rate of gross domestic product (GDP) in U.S. and federal funds rate from the World Bank and the Federal Reserve Bank Reports database respectively to control for macroeconomic factors. Also, for each of the continuous variables in the regression tests, we winsorized it at the 1% and the 99% levels for the entire sample period to mitigate the effect of outliers. The complete sample selection process is presented in Table 1.

[Insert Table 1]

3.2 Methodology

3.2.1 Testing the Effect of Asset Securitization on Loan Approval Before and After the Crisis

First, to examine whether "total asset securitization" have different effects on mortgage loan approval rates between the pre-crisis period and the post-crisis period, we test H1, H2, and H3 by estimating the following regression model on the loan-level mortgage loan approval sample over the pre-crisis period (2004-2006) and the post-crisis period (2010-2017):

$$MORTGAGE_{i,t} = \beta_0 + \beta_1 \times AS\_Total_{i,t-1} + \beta_2 \times After + \beta_3 \times After \times AS\_Total_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_4 \times TCR_{i,t-1} + \beta_5 \times ROA_{i,t-1} + \beta_6 \times LEV_{i,t-1} + \beta_7 \times LIQR_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_8 \times SIZE_{i,t-1} + \beta_9 \times \Delta\, ln(Loan\_Total)_{i,t-1} + \beta_{10} \times NPLR\_Total_{i,t-1}$$
$$MORTGAGE_{i,t} + Controls^{Macro} + Controls^{Loan} + \varepsilon_{i,t} \quad (1)$$

The dependent variable, $Mortgage_{i,t}$, is defined in three ways: the total mortgage loan application approval rates, the high-risk mortgage loan application approval rates, and the

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non-high-risk mortgage loan application approval rates. Since approval rates for each risk-levels are further calculated in terms of the application numbers and the application amounts, we have six approval rates as dependent variables for each observation in the regression model above. For total loan applications, (1) $APR\_N_{i,t}$ is defined as the number of loan applications approved divided by the total number of loan applications, while (2) $APR\_AM_{i,t}$ is defined as the amount of loan applications approved divided by the total amount of loan applications. For high-risk loan applications, (3) $HR\_APR\_N_{i,t}$ is defined as the number of high-priced loan applications approved divided by the total number of high-risk loan applications, while (4) $HR\_APR\_AM_{i,t}$ is defined as the amount of high-priced loan applications approved divided by the total amount of high-risk loan applications. The high-priced loans are approved loans whose annual rates exceed the yield for comparable Treasury securities by a specified threshold (spreads of 3 percentage points for first-lien loans and 5 percentage points for subordinate-lien loans) and the high-risk loans are the sum of high-priced loans and denial loan applications. For non-high-risk loan applications, (5) $NHR\_APR\_N_{i,t}$ is defined as the number of non-high-priced loan applications approved divided by the total number of non-high-risk loan applications, while (6) $NHR\_APR\_AM_{i,t}$ is defined as the amount of non-high-priced loan applications approved divided by the total amount of non-high-risk loan applications. The non-high-risk loans are the differences between total loan applications and high-risk loan applications.

The independent variable of total asset securitization, $AS\_Total_{i,t-1}$, equals 1 if a BHC is with an outstanding principal balance of assets sold and securitized with serving retained, and 0 otherwise. The coefficient β_1 on $AS\_Total_{i,t-1}$ captures the effect of total asset securitization on mortgage loan approval rates before the financial crisis. A negative β_1 indicates that the BHCs with securitization have lower total mortgage loan approval rates

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than BHCs without securitization in the pre-crisis period, consistent with H1. *After* is an indicator variable that equals 1 for the 2010-2017 post-crisis period and equals 0 for the 2004-2006 pre-crisis period. The coefficient β_2 on *After* captures the effect of how mortgage loan approval rates were affected by the regulation amendments after the financial crisis. A negative β_2 indicates that BHCs approved mortgage loan applications with more caution in the post-crisis period, consistent with H2. The coefficient β_3 on $After \times AS\_Total_{i,t-1}$ captures the incremental effect of the total asset securitization on mortgage loan approval rates after the financial crisis. A positive β_3 indicates that the BHCs with total asset securitization have positive incremental effects on mortgage loan approval rates after the financial crisis, consistent with H3. In addition, the expression $\beta_1 + \beta_3$ captures the total effect of the total asset securitization on mortgage loan approval rates after the financial crisis.

To control for BHC characteristics, equation (1) includes seven other bank-level control variables that are often used in regression models related to empirical bank accounting research. The variable $TCR_{i,t-1}$, a proxy for capital ratio, is defined as the total risk-based capital divided by the total risk-weight assets. $ROA_{i,t-1}$, which represents profitability, is defined as net income (loss) divided by average total assets. $LEV_{i,t-1}$, leverage ratio, is defined as total equity divided by total assets. $LIQR_{i,t-1}$, a proxy for liquidity, is defined as liquid assets divided by total assets. Instead of using the traditional definition of liquids assets in balance sheets, the liquid assets used here are calculated as the sum of cash, balances due from depository institutions, held-to-maturity securities, and available-for-sale securities. $SIZE_{i,t-1}$, which stands for company size, is defined as the natural logarithm of total assets. $\Delta ln(Loan\_Total)_{i,t-1}$, a proxy for the growth of total loans, is defined as the change in the natural logarithm of total loans. $NPLR\_Total_{i,t-1}$, nonperforming loan ratio, is defined as the amount of total nonperforming loans divided by the amount of total loans, representing loan

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qualities. All the bank-level variables (including $AS\_Total_{i,t-1}$) are lagged by a year to ensure that the performance and characteristics of BHCs are not affected by the lending behaviors occurring in the following year.

In addition, equation (1) includes the following two control variables since mortgage loan applications are often positively correlated with the macroeconomic environment: ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$. ΔGDP_{t-1} is the annual percentage growth rate of GDP in the U.S., while $\Delta FedFundR_{t-1}$, a proxy for changes in monetary policy, is defined as changes in the federal fund rates. These two control variables are included in the macroeconomic factor ($Controls^{Macro}$) shown in the above regression model.

Equation (1) also includes the loan-level variables to control for the attributes and compositions of mortgage loan applications that might directly or indirectly affect the lending behaviors of BHCs. The loan-level control variables ($Controls^{Loan}$) include the size of loan applications, the average applicant income, the average loan-to-income ratio, the percentage of high-risk loans, the percentage of secured loans, applicant gender, applicant race, and loan applications with co-applicants or not. When we examine the effects on approval rates of total mortgage loan applications and non-high-risk mortgage loan applications, the loan-level control variables consist of factors related to total loan applications, while when examining the effects on approval rates of high-risk mortgage loan applications, the loan-level control variables are composed of factors related to high-risk loan applications. Details and definitions of each variable could be found in the Appendix and control variables for different regression models or dependent variables are further explained in the footnotes of each empirical result table.

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3.2.2 Testing the Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis

We then test H1, H2, and H3 by estimating the following regression model on the loan-level mortgage loan approval sample over the pre-crisis period (2004-2006) and the post-crisis period (2010-2017) to examine whether "real estate secured asset securitization" have different effects on mortgage loan approval rates between the pre-crisis period and the post-crisis period:

$$MORTGAGE_{i,t} = \beta_0 + \beta_1 \times AS\_Real_{i,t-1} + \beta_2 \times After + \beta_3 \times After \times AS\_Real_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_4 \times TCR_{i,t-1} + \beta_5 \times ROA_{i,t-1} + \beta_6 \times LEV_{i,t-1} + \beta_7 \times LIQR_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_8 \times SIZE_{i,t-1} + \beta_9 \times \Delta\, ln(Loan\_Real)_{i,t-1} + \beta_{10} \times NPLR\_Real_{i,t-1}$$
$$MORTGAGE_{i,t} + Controls^{Macro} + Controls^{Loan} + \varepsilon_{i,t} \quad (2)$$

In equation (2), $Mortgage_{i,t}$, *After*, $Control^{Macro}$, $Control^{Loan}$, and most of the bank-level control variables are measured in the same ways as in equation (1). However, the independent variable, $AS\_Real_{i,t-1}$, and the bank-level control variables, $\Delta ln(Loan\_Real)_{i,t-1}$ and $NPLR\_Real_{i,t-1}$, are different from the original variables in equation (1). The independent variable of real estate secured asset securitization, $AS\_Real_{i,t-1}$, equals 1 only if a BHC is with an outstanding principal balance of sale and securitization of loans secured by real estate with serving retained, and 0 otherwise. Similar to equation (1), a negative coefficient β_1 on $AS\_Real_{i,t-1}$ would imply that the BHCs with real estate secured asset securitization have lower total mortgage loan approval rates than BHCs without real estate secured asset securitization, consistent with H1. Additionally, a negative coefficient β_2 on *After* would imply that BHCs' lending behaviors became more prudent after the crisis than before the crisis, and a positive coefficient β_3 on $After \times AS\_Real_{i,t-1}$ indicates that the BHCs with real

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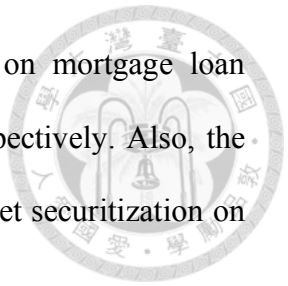

estate secured asset securitization have positive incremental effects on mortgage loan approval rates after the financial crisis, consistent with H2 and H3 respectively. Also, the expression $\beta_1 + \beta_3$ captures the total effect of the real estate secured asset securitization on mortgage loan approval rates after the financial crisis.

For $\Delta ln(Loan\_Real)_{i,t-1}$ in equation (2), a proxy for the growth of loans secured by real estate, is now defined as the change in the natural logarithm of loans secured by real estate, while for $NPLR\_Real_{i,t-1}$, still the nonperforming loan ratio, is now defined as the amount of nonperforming loans secured by real estate divided by the total amount of loans secured by real estate.

4. Empirical Results

4.1 Descriptive Analysis

The full sample in our research consists of all U.S. BHCs with available financial data from FR Y-9C reports and Loan Application Register (LAR) data from the HMDA database ranging from 2004 to 2017. The sample turns out to be an unbalanced panel data of BHCs since we only require the sample BHC to be presented at least once during the research period. Instead of exploiting the variation in mortgage approval rates of the same bank over time, the purpose of our research is to examine the difference in mortgage approval rates between the BHCs with asset securitization and the BHCs without asset securitization before and after the financial crisis. Therefore, we do not remove BHCs to reform a balanced panel data so that we can keep as many observations as possible.

The descriptive statistics of our research start with a few charts. In Figure 1, we plot the yearly average of mortgage loan approval rates for the two groups of BHCs. The blue line represents the group of BHCs with total asset securitization, while the orange line represents

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the group of BHCs without total asset securitization. Yearly averages of mortgage loan approval rates are presented in three categories: the total mortgage loan approval rates, the high-risk mortgage loan approval rates, and the non-high-risk mortgage loan approval rates. For each category, approval rates are measured by both numbers and amounts separately. First, in the total mortgage loan ($APR\_N_{i,t}$ and $APR\_AM_{i,t}$) category, the group of BHCs without total asset securitization experienced higher total approval rates than the other group over the research period. Meanwhile, we can observe that the difference in the total approval rates between the two groups decreased from nearly 10% between 2004 and 2009 to only 5% from 2010 to 2017. From the graph of total approval rates measured by numbers, we find that the total approval rates of the group of BHCs without total asset securitization declined from over 80% to approximately 75%, while the total approval rates of the other group fluctuated around 70% from 2004 to 2017. Second, in the high-risk mortgage loan ($HR\_APR\_N_{i,t}$ and $HR\_APR\_AM_{i,t}$) category, we see a dramatic difference in the high-risk approval rates between the two groups. The high-risk approval rates of the group of BHCs without total asset securitization varied between 30% to 40% from 2004 to 2009, while the high-risk approval rates of the other group fluctuated only from 10% to 20% in the same period. From 2010 to 2017, the difference in the high-risk approval rates between the two groups narrowed to around 5% to 10%, compared to the difference of 20% in the 2004-2009 period. Similar to the results of the total approval rates, the high-risk approval rates of the group of BHCs with total asset securitization fluctuated around a specific value (10%) over the entire period, while the high-risk approval rates of the other group fell considerably from over 30% to under 20%. When it comes to the non-high-risk mortgage loan ($NHR\_APR\_N_{i,t}$ and $NHR\_APR\_AM_{i,t}$) category, the results are different from those of the other two dimensions. We find that the non-high-risk approval rates of both groups decreased gradually

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from around 90% in 2004 to nearly 85% in 2017. Moreover, the difference in the non-high-risk approval rates of the two groups is so slight that the non-high-risk approval rates of the group of BHCs with total asset securitization even surpassed that of the other group in several years.

[Insert Figure 1]

In Figure 2, we still plot the yearly average of mortgage loan approval rates for the two groups of BHCs. Similar to Figure 1, yearly averages of mortgage loan approval rates are presented in three categories, with approval rates in each category further calculated by numbers or amounts basis. However, the blue line and the orange line in Figure 2 stand for the group of BHCs without and with real estate secured asset securitization, respectively. We find that though the BHCs are re-divided into two groups based on with real estate secured asset securitization or not, the results in Figure 2 are almost the same as those in Figure 1. For total mortgage loans and high-risk mortgage loans, the group of BHCs without real estate secured asset securitization experienced higher approval rates than the other group stably from 2004 to 2017, and the difference in the approval rates between the two groups in these two dimensions both shrank noticeably after 2009 (especially for the high-risk approval rates). While for non-high-risk loans, it is obvious that the approval rates of both two groups are nearly the same between 2004 and 2017 and decreased slightly over the entire period.

[Insert Figure 2]

The graphs in Figure 1 and Figure 2 imply that the difference in total approval rates between two groups is mainly caused by the difference in high-risk approval rates despite the sample is divided into two groups by total asset securitization or by real estate secured asset securitization. Also, it is found that the difference in the approval rates of total mortgage loans and high-risk loans between two groups narrowed after 2009 regardless of

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securitization types. In comparison, there is no significant difference between the approval rates of non-high-risk loans of two groups from 2004 to 2017 no matter how the groups are divided.

4.2 Descriptive Statistics

In Table 2, Panel A reports descriptive statistics of the variables in our full sample. For bank-level variables, on average, 11.2% of BHC-year observations are engaged in total asset securitization and 9.3% of observations take part in real estate secured asset securitization. The growth rates of total loans and real estate secured loans are similar, with average $\Delta ln(Loan\_Total)_{i,t-1}$ = 0.093 and average $\Delta ln(Loan\_Real)_{i,t-1}$ = 0.099. In addition, there is nearly no difference between the qualities of total loans and real estate secured loans, since average $NPLR\_Total_{i,t-1}$ = 0.017 and average $NPLR\_Real_{i,t-1}$ = 0.018 when measuring qualities through nonperforming loan ratios, while average $NCOR\_Total_{i,t-1}$ = 0.006 and average $NCOR\_Real_{i,t-1}$ = 0.005 when qualities is evaluated on net charge-off ratio basis.

For overall mortgage loan applications, it is shown that the average approval rates of total mortgage loans are almost the same when calculated by the numbers (average $APR\_N_{i,t}$ = 0.760) and the amounts (average $APR\_AM_{i,t}$ = 0.788) of total mortgage loan applications separately. For applications of high-risk mortgage loans, the average approval rates are similar under both number basis and amount basis, with average high-risk approval rate = 25.7% and 25.5% when measured by numbers and amounts respectively. Besides, the average approval rate of non-high-risk loans is about 88.9% if defined by numbers and nearly 88.5% if defined by amounts. On the other hand, the denial rate of total loan applications is 15.5% when measured in numbers and 11.9% when measured in amounts.

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For Panel B in Table 2, starting with bank-level variables, we observe that the percentages of BHC-year observations participating in either total asset securitization or real estate secured asset securitization increased slightly after the financial crisis, with average $AS\_Total_{i,t-1}$ rising from 0.108 to 0.120 and average $AS\_Real_{i,t-1}$ rising from 0.088 to 0.101. It is also clear that the growth rates of both total loans and real estate secured loans declined dramatically after the crisis, as we can see average $\Delta ln(Loan\_Total)_{i,t-1}$ and average $\Delta ln(Loan\_Real)_{i,t-1}$ decreased from 0.136 and 0.156 before the crisis to 0.060 and 0.058 after the crisis, respectively. In addition, it seems that the qualities of both total loans and real estate secured loans become worse in the post-crisis period than in the pre-crisis period. We find that the average nonperforming loan ratios of total loans and real estate secured loans grew from 0.007 to 0.024 and 0.003 to 0.028 respectively after the crisis. Even if we measure the quality through the net charge-off ratios, we found both $NCOR\_Total_{i,t-1}$ and $NCOR\_Real_{i,t-1}$ rose considerably to 0.008 after the crisis.

Continuing with variables related to overall mortgage loan applications in Panel B, we see that approval rates of total mortgage loans, high-risk mortgage loans, and non-high-risk mortgage loans dropped after the financial crisis. For total mortgage loan applications, it is seen that average $APR\_N_{i,t}$ decreased from 0.803 to 0.734 and average $APR\_AM_{i,t}$ decreased from 0.829 to 0.765. For high-risk mortgage loan applications, the average approval rates plunged significantly from 0.332 to 0.174 and 0.170 when measured under number basis and amount basis respectively. The steep decrease in average approval rates of high-risk loans is consistent with our results presented in Figure 1 and Figure 2. While for approval rates of non-high-risk mortgage loans, $NHR\_APR\_N_{i,t}$ and $NHR\_APR\_AM_{i,t}$ fell slightly from 0.914 and 0.907 to 0.873 respectively. In contrast, the denial rates of total loan applications

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increased from 0.130 to 0.168 and 0.095 to 0.131 after the financial crisis when calculated by numbers and amounts of total mortgage loan applications separately.

[Insert Table 2]

4.3 Effect of Total Asset Securitization on Loan Approval Before and After the Crisis

Table 3 reports the estimation of equation (1) regarding the effect of total asset securitization on mortgage loan approval rates before and after the financial crisis using the sample in the pre-crisis period (2004-2006) and the post-crisis period (2010-2017). The coefficients on the variables of interest to us, $AS\_Total_{i,t-1}$ and *After* are negative, while the coefficient on $After \times AS\_Total_{i,t-1}$ is positive. In other words, before considering the significance levels, we find that (1) both total asset securitization and the financial crisis have negative effects on mortgage loan approval rates, and (2) there seems to be a positive incremental effect on mortgage loan approval rates after the financial crisis.

Starting with $APR\_N_{i,t}$ as dependent variable in column (1), the coefficients of $AS\_Total_{i,t-1}$ and *After* are significantly negative (β_1 = -0.0328, *t*-statistic = -2.129 and β_2 = -0.0607, *t*-statistic = -6.348), while the coefficient of $After \times AS\_Total_{i,t-1}$ is significantly positive (β_3 = 0.0398, *t*-statistic = 2.276). In terms of economic significance, these coefficients imply that (1) the overall mortgage loan approval rates of all BHCs declined 6.07% after the financial crisis, and (2) BHCs with total asset securitization yielded a noticeable 3.28% reduction in the total mortgage loan approval rates before the crisis, but the reduction was later eliminated by a 3.98% increase after the financial crisis. In fact, the sum of the coefficients on $AS\_Total_{i,t-1}$ and $After \times AS\_Total_{i,t-1}$ is equal to nearly 0 ($\beta_1 + \beta_3 = 0.007$, *t*-statistic = 0.001) and presents an insignificant total effect of total asset securitization on mortgage loan approval rates after the financial crisis. If we change the dependent variable, total mortgage

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loan approval rates, from measuring by the numbers of applications to measuring by the amounts of applications (i.e., $APR\_AM_{i,t}$), the results are similar to those in column (1) as presented in column (2). These results are consistent with H1, H2, and H3, which assume that both asset securitization and the financial crisis had negative effects on mortgage loan approval rates, while there was a positive incremental effect of total asset securitization on mortgage loan approval rates after the financial crisis.

While for column (3) and column (4), we focus on the effect of total asset securitization on approval rates of high-risk mortgage loans rather than on total mortgage loans. Though the dependent variable has changed to $HR\_APR\_N_{i,t}$ and $HR\_APR\_AM_{i,t}$ respectively, we are still interested in the coefficients of $AS\_Total_{i,t-1}$, *After*, and *After* × $AS\_Total_{i,t-1}$ as in the previous paragraph. Take column (3), using $HR\_APR\_N_{i,t}$ as dependent variable, for example, we obtain that the coefficients of $AS\_Total_{i,t-1}$ and *After* are significantly negative (β_1 = -0.0811, *t*-statistic = -2.759 and β_2 = -0.0814, *t*-statistic = -4.117), while the coefficient of *After* × $AS\_Total_{i,t-1}$ is significantly positive (β_3 = 0.0959, *t*-statistic = 3.388). From an economic significance perspective, the coefficients imply that (1) the approval rates of high-risk loans for all BHCs in the post-crisis period were averagely 8.14% lower than those in the pre-crisis period, and (2) before the financial crisis, the possibility for BHCs with total asset securitization to approve the high-risk mortgage loans was 8.11% lower than the BHCs without total asset securitization. However, the difference in the high-risk loan approval rates between the two BHCs group almost disappeared after the financial crisis, as we see column (3) shows an insignificant total effect of total asset securitization on high-risk loan approval rates ($\beta_1 + \beta_3$ = 0.0148, *t*-statistic = 0.001) in the post-crisis period. Similar results are observed in column (4) if we use $HR\_APR\_AM_{i,t}$ as the dependent variable. The results in column (3) and column (4) are both consistent with our H1, H2, and H3. Moreover, these

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results are much stronger than those in column (1) and column (2) since we reach the significance level of 1%.

On the other hand, we examine the effect of total asset securitization on approval rates of non-high-risk mortgage loans before and after the financial crisis, and the results are presented in column (5) and column (6), with $NHR\_APR\_N_{i,t}$ and $NHR\_APR\_AM_{i,t}$ as dependent variable respectively. For the coefficients of $AS\_Total_{i,t-1}$, *After*, and *After* × $AS\_Total_{i,t-1}$ in column (5) and column (6), the directions are the same as those in column (1) to column (4), but only the results of *After* reach a 1% significance level, consistent with H2. The insignificant coefficients on the other main independent variables suggest that when discussing the effect of total asset securitization on non-high-risk approval rates, neither the negative effect before the financial crisis nor the positive incremental effect after the crisis exists.

[Insert Table 3]

4.4 Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis

Table 4 reports the estimation of equation (2) regarding the effect of real estate secured asset securitization on mortgage loan approval rates after the financial crisis using the sample in the pre-crisis period (2004-2006) and the post-crisis period (2010-2017). Similar to equation (1), we are interested in the coefficient on $AS\_Real_{i,t-1}$, *After*, and *After* × $AS\_Real_{i,t-1}$. Observing the directions of the coefficients, we find a negative relation between the approval rate of mortgage loans and the real estate secured asset securitization before the financial crisis and a positive incremental effect of the real estate secured asset securitization

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after the financial crisis. In addition, it is shown that the approval rate of mortgage loans decreased dramatically despite the risk level of mortgage loans.

The dependent variable in column (1) is $APR\_N_{i,t}$, and the coefficient of $AS\_Real_{i,t-1}$ and *After* are significantly negative (β_1 = -0.0312, *t*-statistic = -1.805 and β_2 = -0.0595, *t*-statistic = -6.221), while the coefficient of *After* × $AS\_Total_{i,t-1}$ is significantly positive (β_3 = 0.0309, *t*-statistic = 1.871). In terms of economic significance, these coefficients imply that (1) the total mortgage loan approval rates dropped 5.95% averagely from before to after the financial crisis, and (2) BHCs with real estate secured asset securitization tend to lend money more carefully before the financial crisis, resulting in total mortgage loan approval rates 3.12% lower than those of the BHCs without real estate secured asset securitization. Meanwhile, the difference in the total mortgage loan approval rates between the two groups of BHCs was later disappeared in the post-crisis period, as real estate secured asset securitization brought a positive incremental effect of 3.09% on the total mortgage loan approval rates. These results are consistent with H1, H2, and H3. In addition, the positive incremental effect results in a significant but nearly zero total effect of real estate secured asset securitization on the total mortgage loan approval rates after the financial, with $\beta_1 + \beta_3$ = 0.0003 and *t*-statistic = 5.645 in column (1). In column (2), we replace the dependent variable from $APR\_N_{i,t}$ to $APR\_AM_{i,t}$, and we find that the coefficients of $AS\_Real_{i,t-1}$ (β_1 = -0.0377, *t*-statistic = -1.594), *After* (β_2 = -0.0704, *t*-statistic = -6.076), and *After* × $AS\_Real_{i,t-1}$ (β_3 = -0.0303, *t*-statistic = 1.593) remain the same directions as in column (1), while the coefficients of $AS\_Real_{i,t-1}$ and *After* × $AS\_Real_{i,t-1}$ are close to but do not meet a 10% significance level. These results suggest that the negative effect in the pre-crisis period and the positive incremental effect in the post-crisis period of real estate secured asset securitization on the total mortgage loan approval rates are more related to the numbers of applications rather than the amounts of applications.

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For column (3) and column (4), we focus on the effect of real estate secured asset securitization on approval rates of high-risk mortgage loans rather than on total mortgage loans. The dependent variable for column (3) and column (4) is changed to $HR\_APR\_N_{i,t}$ and $HR\_APR\_AM_{i,t}$ respectively, and we still focus on the coefficients of $AS\_Total_{i,t-1}$, *After*, and $After \times AS\_Total_{i,t-1}$ as in the previous paragraph. When using $HR\_APR\_N_{i,t}$ as the dependent variable in column (3), we find a significant and negative relation between the approval rates of high-risk loans and real estate secured asset securitization before the financial crisis (β_1 = -0.0614, *t*-statistic = -2.200), and a positive incremental effect of the real estate secured asset securitization is observed after the financial crisis (β_3 = 0.0957, *t*-statistic = 3.186), consistent with H1 and H3. Also, the coefficient on *After* is significantly negative (β_2 = -0.0780, *t*-statistic = -3.884), consistent with H2. From an economic significance perspective, the coefficients in column (3) imply that (1) the high-risk loan approval rates of all BHCs decreased 7.8% averagely after the financial crisis, and (2) in the pre-crisis period, BHCs with real estate secured asset securitization tend to approve the high-risk loans with more caution, resulting in a 6.14% reduction in high-risk approval rates compared to the BHCs without real estate secured asset securitization. In addition, the difference in the high-risk approval rates between the two groups of BHCs was later disappeared as real estate secured asset securitization brought a 9.57% incremental effect on high-risk approval rates after the financial crisis. At the same time, we observe that column (3) shows an insignificant total effect of real estate secured asset securitization on high-risk loan approval rates ($\beta_1 + \beta_3$ = 0.0343, *t*-statistic = 1.286) in the post-crisis period. Similar results for the negative effect of the financial crisis (β_2 = -0.0614, *t*-statistic = 2.556) and positive incremental effect of real estate secured asset securitization in the post-crisis period (β_3 = 0.0880, *t*-statistic = 2.568) are observed in column (4) if we use $HR\_APR\_AM_{i,t}$ as dependent variable, while the

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negative effect of real estate secured asset securitization on high-risk approval rates fails to meet a 10% significance level (β_1 = -0.0410, *t*-statistic = 1.308).

Nevertheless, when we examine the effect of real estate secured asset securitization on approval rates of non-high-risk mortgage loans before and after the financial crisis, with $NHR\_APR\_N_{i,t}$ and $NHR\_APR\_AM_{i,t}$ as dependent variable in column (5) and column (6) respectively, the results are quite different from those in column (1) to column (4). In fact, when we investigate the effect of the real estate secured asset securitization on non-high-risk approval rates, it is shown that the negative effect before the crisis (β_1 = -0.0208, *t*-statistic = -0.936 in column (5) and β_1 = -0.0271, *t*-statistic = -1.125 in column (6)) and the positive incremental effect after the crisis (β_3 = 0.0072, *t*-statistic = 0.416 in column (5) and β_3 = 0.0086, *t*-statistic = 0.464 in column (6)) are both insignificant despite measuring the non-high-risk approval rates in number basis or in amount basis. The insignificant coefficients of $AS\_Total_{i,t-1}$ and $After \times AS\_Total_{i,t-1}$ suggest that when discussing the effect of real estate secured asset securitization on non-high-risk approval rates, neither the negative effect before the financial crisis nor the positive incremental effect after the crisis exists. In contrast, the effect of the financial crisis on non-high-risk approval rates remains significantly negative (β_2 = -0.0357, *t*-statistic = -3.856 in column (5) and β_2 = -0.0375, *t*-statistic = -3.507 in column (6)) as in column (1) to column (4), consistent with H2.

[Insert Table 4]

4.5 Robustness Tests

4.5.1 Using Overall Net Charge-Off Ratio as Proxy for Credit Risk

We first use an alternative proxy for loan qualities to start our robustness tests. Instead of using the nonperforming loan ratio ($NPLR\_Total_{i,t-1}$) as measurement, we use the net charge-

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off ratio ($NCOR\_Total_{i,t-1}$) as the proxy for loan qualities. The net charge-off ratio is defined as the amount of net charge-off divided by the amount of total loans, and the net charge-off is the difference between the gross charge-off and any subsequent recoveries of delinquent debts.

Panel A in Table 5 presents the regression results about the effect of total asset securitization on mortgage loan approval rates, while Panel B presents the regression results about the effect of real estate secured asset securitization on mortgage loan approval rates before and after the financial crisis. The results in both Panel A and Panel B are similar to our main results regardless of risk levels of loans or calculation basis of approval rates.

[Insert Table 5]

4.5.2 Redefining the Pre-Crisis and the Post-Crisis Periods

Second, since the financial crisis period in our main tests is defined as from 2007 to 2009, it is concerned that different definitions of the financial crisis period could lead to different results. Thus, we conduct robustness tests redefining the pre-crisis period and post-crisis period as the following sets of subsamples: (1) 2004-2005 versus 2010-2017, (2) 2004-2006 versus 2011-2017, and (3) 2004-2005 versus 2011-2017. The regression results are reported in Table 6, with Panel A and Panel B representing set (1), Panel C and Panel D representing set (2), and Panel E and Panel F representing set (3). For each set of comparisons in Table 6, the effect of total asset securitization on mortgage loan approval rates is reported first, with the effect of real estate secured asset securitization on mortgage loan approval rates reported in the subsequent panel.

The results presented in Table 6 are similar to our main results regardless of the set of subsamples. In other words, the negative effects that the financial crisis and asset

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securitization had on total approval rates and high-risk approval rates before the financial crisis, and the positive incremental effects on total approval rates and high-risk approval rates after the financial crisis are robust despite the different definitions of the financial crisis period.

[Insert Table 6]

4.5.3 Using Full Sample through Adding the Crisis Variable

In our previous main tests, we use only the observations in the pre-crisis period (2004-2006) and the post-crisis period (2010-2017). Hence, we decide to include the observations during the financial crisis in our third robustness test. In other words, we use the full sample from 2004 to 2017 and modify our regression models as follows, with equation (3) for testing the effect of total asset securitization and equation (4) for testing the effect of real estate secured asset securitization on mortgage loan approval rates:

$$MORTGAGE_{i,t} = \beta_0 + \beta_1 \times AS\_Total_{i,t-1} + \beta_2 \times After + \beta_3 \times CRISIS$$
$$MORTGAGE_{i,t} + \beta_4 \times After \times AS\_Total_{i,t-1} + \beta_5 \times CRISIS \times AS\_Total_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_6 \times TCR_{i,t-1} + \beta_7 \times ROA_{i,t-1} + \beta_8 \times LEV_{i,t-1} + \beta_9 \times LIQR_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_{10} \times SIZE_{i,t-1} + \beta_{11} \times \Delta\, ln(Loan_Total)_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_{12} \times NPLR\_Total_{i,t-1} + Controls^{Macro} + Controls^{Loan} + \varepsilon_{i,t} \quad (3)$$

$$MORTGAGE_{i,t} = \beta_0 + \beta_1 \times AS\_Real_{i,t-1} + \beta_2 \times After + \beta_3 \times CRISIS$$
$$MORTGAGE_{i,t} + \beta_4 \times After \times AS\_Real_{i,t-1} + \beta_5 \times CRISIS \times AS\_Total_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_6 \times TCR_{i,t-1} + \beta_7 \times ROA_{i,t-1} + \beta_8 \times LEV_{i,t-1} + \beta_9 \times LIQR_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_{10} \times SIZE_{i,t-1} + \beta_{11} \times \Delta\, ln(Loan_Total)_{i,t-1}$$
$$MORTGAGE_{i,t} + \beta_{12} \times NPLR\_Total_{i,t-1} + Controls^{Macro} + Controls^{Loan} + \varepsilon_{i,t} \quad (4)$$

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For equation (3) and equation (4), *CRISIS* equals 1 for the 2007-2009 financial crisis period, and 0 otherwise, while *After* is an indicator variable that equals 1 for the 2010-2017 post-crisis period, and 0 otherwise. Table 7 presents the results when using the full sample in our regression tests, with Panel A reports the effect of total asset securitization on mortgage loan approval rates, and Panel B reports the effect of real estate secured asset securitization on mortgage loan approval rates before and after the financial crisis. The results in Table 7 show that (1) the financial crisis had significant negative effects on mortgage loan approval rates despite the risk levels of loans, and (2) asset securitization had negative effects on approval rates of total mortgage loans and high-risk mortgage loans before the financial crisis, but a positive incremental effect on the approval rates of total mortgage loans and high-risk mortgage loans after the financial crisis, which are consistent with our main results.

[Insert Table 7]

4.5.4 Using Denial Rate as Proxy for Mortgage Lending Behavior

On the other hand, we are also interested in the effect of asset securitization on BHCs' lending behaviors if measured by mortgage loan denial rates instead of mortgage loan approval rates. Thus, we use alternative proxies for mortgage lending behaviors to do the robustness tests. We defined the denial rates of mortgage loan applications as the applications denied by banks divided by the total loan applications, with $DENY\_N_{i,t}$ calculated by numbers of applications and $DENY\_AM_{i,t}$ calculated by amounts of applications.

The results are presented in Table 8, with column (1) and column (2) representing the effect of total asset securitization on mortgage loan approval rates, while column (3) and column (4) representing the effect of real estate secured asset securitization on mortgage loan approval rates. When we investigate the effects of both types of securitization on denial rates,

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we find insignificant positive effects before the financial crisis, but significant negative incremental effects after the financial crisis. Additionally, the financial crisis shows significant positive effects on mortgage loan denial rates. These results represent the opposite directions compared to our main results and have implications similar to our primary findings since denial rates and approval rates are negatively correlated.

[Insert Table 8]

5. Conclusions

Securitization is often criticized for enabling banks to operate with higher leverage while transferring credit risks to the entire market simultaneously, which eventually regarded as one of the major causes of the financial crisis. Instead of focusing on only performance of the banks with securitization as prior researches do, our research examines how securitization and the financial crisis affect the lending behaviors among different groups of banks. Using the HMDA database, we find that BHCs with securitization had lower mortgage loan approval rates than BHCs with securitization before the financial crisis. In addition, all the BHCs experienced significant decreases in mortgage loan approval rates despite the risk levels of loans after the financial crisis. Furthermore, we find that U.S. BHCs without securitization modify their lending behaviors dramatically with a clear decline in the mortgage loan approval rates. Similar results are found when we have U.S. BHCs without real estate secured asset securitization as the control group. These results are consistent with our assumption that BHCs with securitization were already under more pressure from reputation maintenance and therefore approved loans more carefully than the other banks before the financial crisis, and that regulatory reform indeed made all BHCs, especially BHCs without securitizations, improve their lending processes. When further investigate the

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approval rates of loans with different risk levels, we find that the narrowed difference in the mortgage loan approval rates between BHCs with and without securitization after the financial crisis is mainly caused by the changes in high-risk loan approval rates. In conclusion, the results show that BHCs without securitization learned from the 2008 financial crisis and made more adjustments to adapt to a more rigorously regulated environment after the crisis, while BHCs with securitization screen loan applications with caution for reputation considerations and were less affected by the regulation revisions.

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Appendix

Variable Definitions

Variables	Definition
	Dependent Variables
APR_N	Approval rates of total loans (measured by the number of applications), defined as the number of loan applications approved divided by the total number of loan applications.
APR_AM	Approval rates of total loans (measured by amounts), defined as the amount of loan applications approved divided by the total amount of loan applications.
HR_APR_N	Approval rates of high-risk loans (measured by the number of applications), defined as the number of high-priced loan applications approved divided by the total number of high-risk loan applications. The high-priced loans are approved loans whose annual rates exceed the yield for comparable Treasury securities by a specified threshold (spreads of 3 percentage points for first-lien loans and 5 percentage points for subordinate-lien loans). The high-risk loans are the sum of high-priced loans and denial loan applications.
HR_APR_AM	Approval rates of high-risk loans (measured by amounts), defined as the amount of high-priced loan applications approved divided by the total amount of high-risk loan applications. The high-priced loans are approved loans whose annual rates exceed the yield for comparable Treasury securities by a specified threshold (spreads of 3 percentage points for first-lien loans and 5 percentage points for subordinate-lien loans). The high-risk loans are the sum of high-priced loans and denial loan applications.
NHR_APR_N	Approval rates of non-high-risk loans (measured by the number of applications), defined as the number of non-high-priced loan applications approved divided by the total number of non-high-risk loan applications. The non-high-risk loans are the differences between total loan applications and high-risk loan applications.
NHR_APR_AM	Approval rates of non-high-risk loans (measured by amounts), defined as the amount of non-high-priced loan applications approved divided by the total amount of non-high-risk loan applications. The non-high-risk loans are the differences between total loan applications and high-risk loan applications.
DENY_N	Denial rates of total loans (measured by the number of applications), defined as the number of loan applications denied divided by the total number of loan applications.
DENY_AM	Denial rates of total loans (measured by amounts), defined as the denied loan amounts divided by the total amount of loan applications.
	Independent Variables
AS_Total	*AS_Total* equals 1 (0) if a BHC is (not) with an outstanding principal balance of assets sold and securitized with serving retained.
AS_Real	*AS_Real* equals 1 (0) if a BHC is (not) with an outstanding principal balance of assets sold and securitized with serving retained, and the assets are made with loans secured by real estate.
After	Equals 1 for the 2010-2017 post-crisis period, while equals 0 for the 2004-2006 pre-crisis period.
After_6789	Equals 1 for the 2010-2017 post-crisis period, while equals 0 for the 2004-2005 pre-crisis period.

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After_7890	Equals 1 for the 2011-2017 post-crisis period, while equals 0 for the 2004-2006 pre-crisis period.
After_67890	Equals 1 for the 2011-2017 post-crisis period, while equals 0 for the 2004-2005 pre-crisis period.
CRISIS	Equals 1 for the 2007-2009 financial crisis period, and 0 otherwise.
Control Variables	
TCR	Total risk-based capital ratio, defined as the total risk-based capital divided by the total risk-weight assets.
ROA	Return on assets, defined as net income (loss) divided by average total assets.
LEV	Leverage ratio, defined as total equity divided by total assets.
LIQR	Liquidity ratio, defined as liquid assets divided by total assets.
SIZE	Company size, defined as the natural logarithm of total assets.
Δln(Loan_Total)	Growth of the total loans, defined as the change in the natural logarithm of total loans.
Δln(Loan_Real)	Growth of the loans secured by real estate, defined as the change in the natural logarithm of loans secured by real estate.
NPLR_Total	Nonperforming loan ratio, defined as the amount of total nonperforming loans divided by the amount of total loans. Nonperforming loans are loans past due 90 days or more and non-accrual loans.
NPLR_Real	Nonperforming loan ratio of loans secured by real estate, defined as the amount of nonperforming loans secured by real estate divided by the total amount of loans secured by real estate. Nonperforming loans are loans past due 90 days or more and non-accrual loans.
NCOR_Total	Net charge-off ratio, defined as the amount of net charge-off divided by the amount of total loans. The net charge-off is the difference between gross charge-off and any subsequent recoveries of delinquent debts.
NCOR_Real	Net charge-off ratio of loans secured by real estate, defined as the amount of net charge-off related to loans secured by real estate divided by the total amount of loans secured by real estate. The net charge-off is the difference between gross charge-off and any subsequent recoveries of delinquent debts.
ΔGDP	Annual percentage growth rate of GDP at market prices in the U.S. based on constant local currency.
ΔFedFundR	Proxy for changes in monetary policy, defined as changes in the federal fund rates.
ltir	Average loan-to-income ratio, defined as the average of the loan-to-income ratio of each loan application.
ln(loan_n)	Natural logarithm of the number of total loan applications.
ln(loan_am)	Natural logarithm of the amount of total loan applications.
applincome_total	Average applicant income of total loan applications.
p_secured	Percentage of total loan applications secured by either first or subordinate liens.
p_male	Percentage of total loan applications with male applicants.
p_white	Percentage of total loan applications with white applicants.
p_latino	Percentage of total loan applications with Hispanic or Latino.
p_coapplicant	Percentage of total loan applications with co-applicants.

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p_hrl_n	Percentage of high-risk loan applications over total loan applications.
p_hrl_am	Percentage of high-risk loan amounts over total loan amounts.
ln(hrl_n)	Natural logarithm of the number of high-risk loan applications.
ln(hrl_am)	Natural logarithm of the amount of high-risk loan applications.
applincome_hrl	Average applicant income of high-risk loan applications.
p_secured_hrl	Percentage of high-risk loan applications secured by either first or subordinate liens.
p_male_hrl	Percentage of high-risk loan applications with male applicants.
p_white_hrl	Percentage of high-risk loan applications with white applicants.
p_latino_hrl	Percentage of high-risk loan applications with Hispanic or Latino.
p_coapplicant_hrl	Percentage of high-risk loan applications with co-applicants.

[a] We identify whether the loan applications are approved or denied by financial institutions based on the "Action Type (Action Taken)" section of LAR data.

[b] Our sample includes only applications with "Action Type (Action Taken)" codes ranging from 1 to 5; definition for "Action Type (Action Taken)" codes are as follows:
Action Type = 1: Loan originated.
Action Type = 2: Application approved but not accepted.
Action Type = 3: Application denied by financial institution.
Action Type = 4: Application withdrawn by applicant.
Action Type = 5: File closed for incompleteness.

[c] Total number (amount) of loan applications is the sum of applications labeling "Action Type" from 1 to 5.

[d] Number (amount) of loan applications approved is the sum of applications labeling "Action Type" with 1 or 2.

[e] Number (amount) of loan applications denied is the sum of applications labeling "Action Type" with 3.

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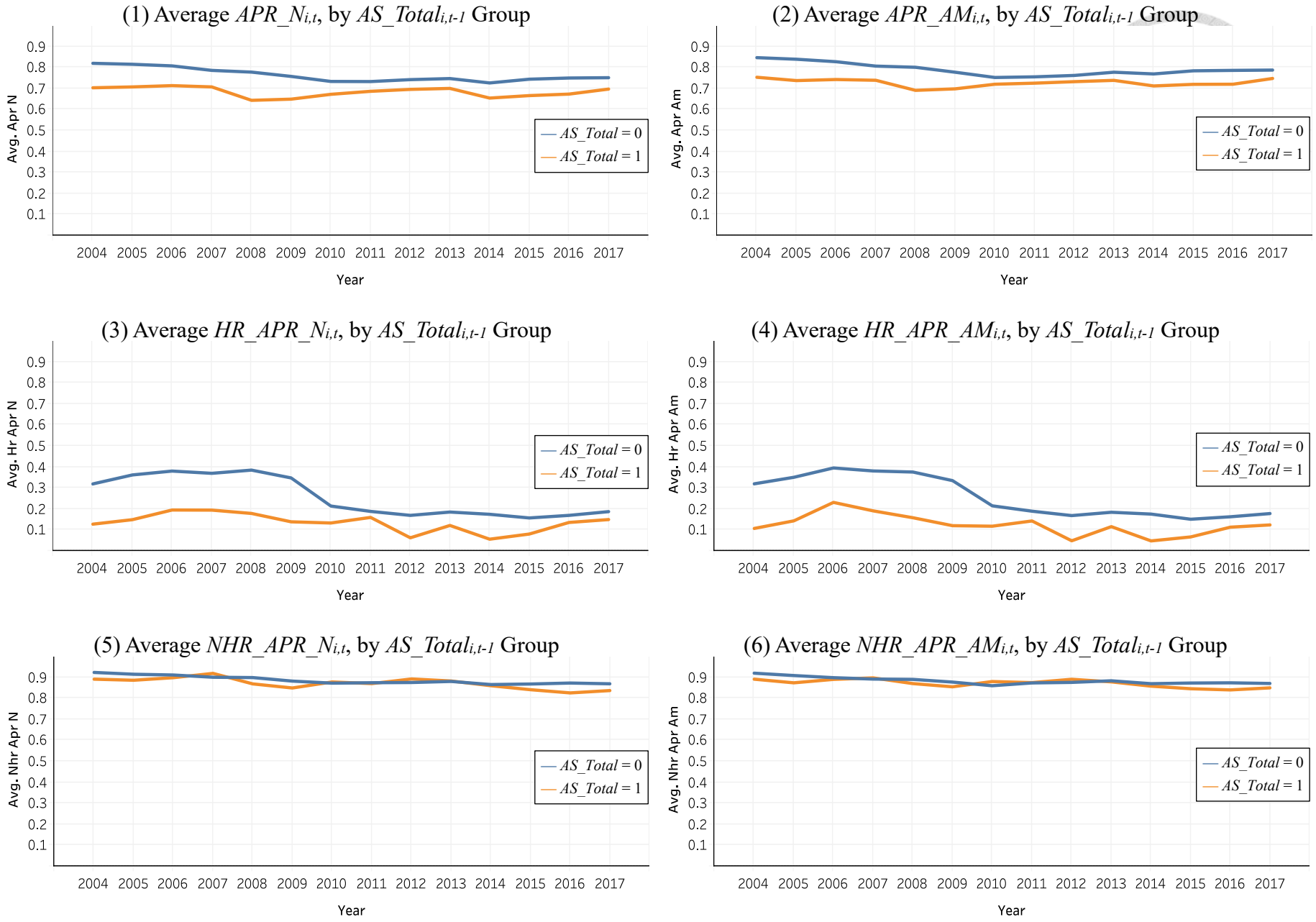
Figure 1 Average Approval Rates by Total Asset Securitization (*AS_Total*) Group



[a] The definitions of variables are provided in the Variable Definitions part of the Appendix.
[b] $AS\_Total_{i,t-1}$ is lagged by a year to ensure that the performance and characteristics of BHCs are not affected by the lending behaviors (e.g., $APR\_N_{i,t}$) occurring in the following year.

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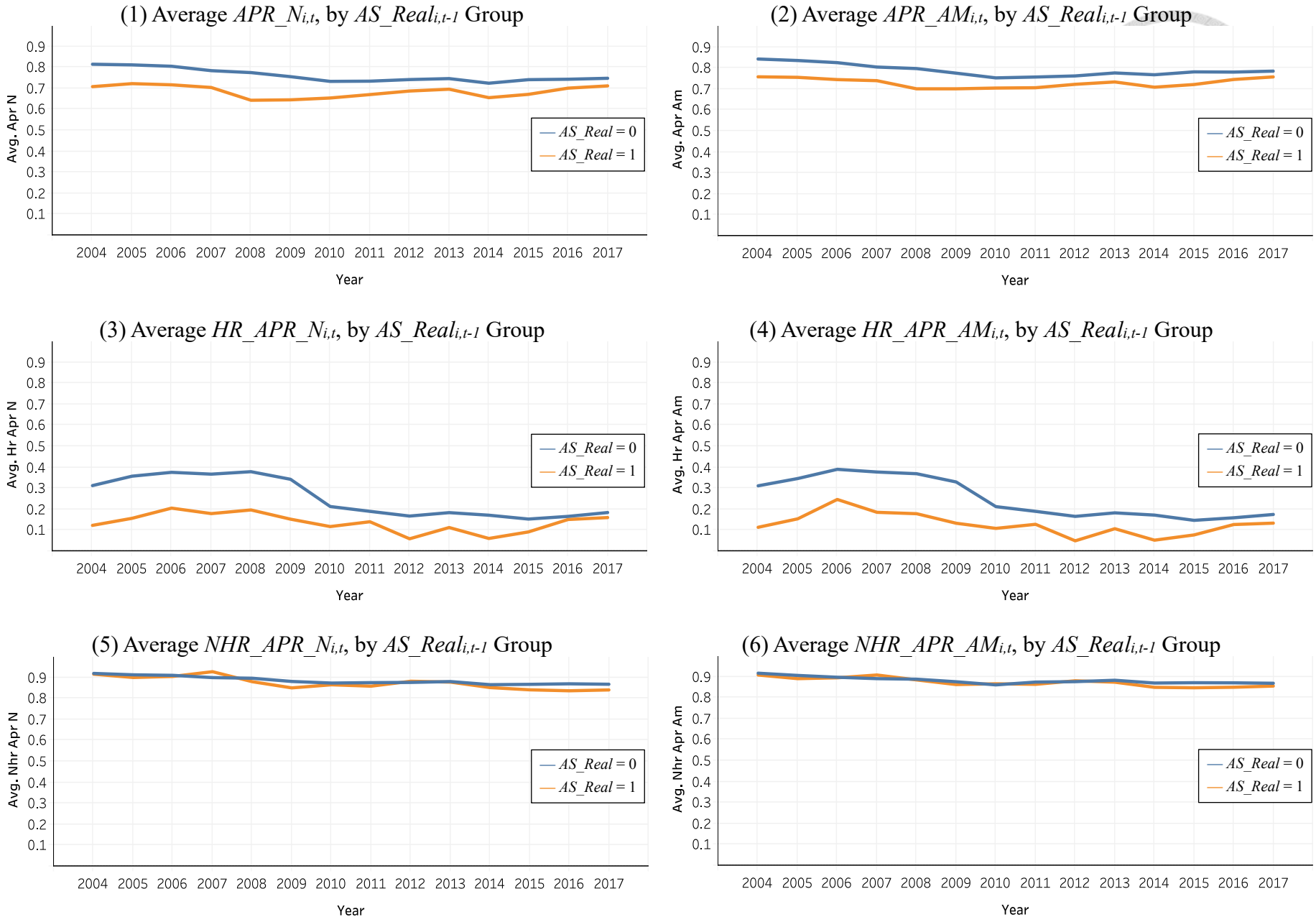
Figure 2 Average Approval Rates by Real Estate Secured Asset Securitization (*AS_Real*) Group



[a] The definitions of variables are provided in the Variable Definitions part of the Appendix.
[b] $AS\_Real_{i,t-1}$ is lagged by a year to ensure that the performance and characteristics of BHCs are not affected by the lending behaviors (e.g., $APR\_N_{i,t}$) occurring in the following year.

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Table 1 BHC Sample

Panel A: Selection Process	**# of BHCs**
Match all U.S. BHCs of the Bank Regulator data set with those of the CRSP data set base on the CRSP-FRB Link during 2004-2017 to limit the sample to only parent holding companies.	1,167
Delete non-December year-end BHCs, BHCs with data less than a complete year, and observations missing basic financial data.	(550)
Delete BHCs missing HMDA data.	(67)
Final Sample	550

Panel B: Number of BHCs by Year	
Year	# of BHCs
2004	398
2005	406
2006	353
2007	341
2008	331
2009	328
2010	310
2011	300
2012	292
2013	307
2014	286
2015	242
2016	189
2017	181
Total Number of Observations	4,264

[a] To limit our sample to only parent holding companies, we first match all U.S. BHCs between 2004 and 2017 from the Bank Regulator data set with those of the Center for Research in Security (CRSP) data set base on the CRSP-FRB Link. Bank Regulator data set is provided by Wharton Research Data Services(WRDS) and gives financial data from BHCs, including data in FR Y-9 reports.

[b] The CRSP-FRB Link is offered by the Federal Reserve Bank (FRB) of New York, which helps us to link a unique regulatory identification number (RSSD ID) of a BHC to a unique CRSP identifier (PERMCO). The CRSP-FRB Link is available at https://www. newyorkfed.org/research/banking_research/datasets.html. (Federal Reserve Bank of New York. 2017. *CRSP-FRB Link*.)

[c] FR Y-9 reports can be split into two reports: FR Y-9C (consolidated statements) and FR Y-9LP (parent-company-only statements). The FR Y-9C is a primary analytical tool used to monitor financial institutions between on-site inspections.

[d] The threshold for filing the FR Y-9C is $500 million since March 2006 and the threshold change from $500 million to $1 billion, and from $1 billion to $3 billion effective March 2015 and September 2018, respectively.

[e] After deleting BHCs missing necessary financial data, we then use the unique RSSD ID of each BHC to search for its subsidiaries through the Federal Deposit Insurance Corporation (FDIC) website. We further define the subsidiary with the largest size of total assets as the main subsidiary of each BHC and combine the Respondent ID of the subsidiary found on the HMDA website with its parent BHC.

[f] Finally, we can collect the Loan Application Register (LAR) data of each BHC according to the subsidiary-represented Respondent ID combined previously. Data before 2014 is collected from the National Archives, while data from 2015 to 2017 is collected from the HMDA website.

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Table 2 Descriptive Statistics

Panel A: Full Sample

Variable	Count	Mean	SD..	Min.	Q1..	Median	Q3..	Max.
Bank-Level Variables								
$AS\_Total_{i,t-1}$	4,264	0.112	0.315	0.000	0.000	0.000	0.000	1.000
$AS\_Real_{i,t-1}$	4,264	0.093	0.290	0.000	0.000	0.000	0.000	1.000
$TCR_{i,t-1}$	4,264	0.141	0.031	0.079	0.120	0.135	0.155	0.266
$ROA_{i,t-1}$	4,264	0.007	0.010	-0.041	0.005	0.009	0.012	0.023
$LEV_{i,t-1}$	4,264	0.098	0.024	0.040	0.082	0.096	0.112	0.172
$LIQR_{i,t-1}$	4,264	0.242	0.105	0.051	0.165	0.225	0.305	0.557
$SIZE_{i,t-1}$	4,264	14.814	1.622	12.512	13.688	14.408	15.537	20.981
$\Delta ln(Loan\_Total)_{i,t-1}$	4,264	0.093	0.142	-0.228	0.000	0.074	0.154	0.624
$\Delta ln(Loan\_Real)_{i,t-1}$	4,264	0.099	0.157	-0.236	0.000	0.076	0.167	0.708
$NPLR\_Total_{i,t-1}$	4,264	0.017	0.019	0.000	0.005	0.010	0.022	0.101
$NPLR\_Real_{i,t-1}$	4,264	0.018	0.024	0.000	0.002	0.009	0.024	0.120
$NCOR\_Total_{i,t-1}$	4,264	0.006	0.009	-0.001	0.001	0.002	0.006	0.049
$NCOR\_Real_{i,t-1}$	4,264	0.005	0.009	-0.001	0.000	0.001	0.004	0.049
After	3,264	0.646	0.478	0.000	0.000	1.000	1.000	1.000
After_6789	2,911	0.724	0.447	0.000	0.000	1.000	1.000	1.000
After_7890	2,954	0.608	0.488	0.000	0.000	1.000	1.000	1.000
After_67890	2,601	0.691	0.462	0.000	0.000	1.000	1.000	1.000
CRISIS	4,264	0.235	0.424	0.000	0.000	0.000	0.000	1.000
Macroeconomic Variables								
ΔGDP_{t-1}	4,264	0.020	0.016	-0.025	0.016	0.025	0.029	0.038
$\Delta FedFundR_{t-1}$	4,264	-0.000	0.014	-0.041	-0.001	0.000	0.011	0.020
Variables Related to Total Loan Applications								
$APR\_N_{i,t}$	4,264	0.760	0.127	0.333	0.690	0.773	0.851	0.986
$APR\_AM_{i,t}$	4,264	0.788	0.128	0.341	0.718	0.804	0.881	0.996
$HR\_APR\_N_{i,t}$	4,264	0.257	0.253	0.000	0.048	0.173	0.406	1.000
$HR\_APR\_AM_{i,t}$	4,264	0.255	0.270	0.000	0.032	0.151	0.400	1.000
$NHR\_APR\_N_{i,t}$	4,264	0.889	0.095	0.497	0.843	0.911	0.960	1.000
$NHR\_APR\_AM_{i,t}$	4,264	0.885	0.102	0.443	0.837	0.908	0.960	1.000
$DENY\_N_{i,t}$	4,264	0.155	0.100	0.000	0.082	0.139	0.204	0.515
$DENY\_AM_{i,t}$	4,264	0.119	0.088	0.000	0.056	0.100	0.161	0.465
$ltir_{i,t}$	4,264	1.937	0.682	0.523	1.495	1.896	2.333	4.363
$ln(loan\_n)_{i,t}$	4,264	6.958	1.827	2.708	5.823	6.887	8.034	12.518
$ln(loan\_am)_{i,t}$	4,264	12.140	1.794	8.303	10.998	11.959	13.157	18.163

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applincome_total$_{i,t}$	4,264	130.946	95.204	54.000	83.295	102.903	138.877	695.250
p_secured$_{i,t}$	4,264	0.942	0.091	0.536	0.920	0.980	1.000	1.000
p_male$_{i,t}$	4,264	0.656	0.107	0.231	0.612	0.677	0.726	0.836
p_white$_{i,t}$	4,264	0.777	0.173	0.111	0.714	0.820	0.899	0.981
p_latino$_{i,t}$	4,264	0.040	0.053	0.000	0.010	0.021	0.046	0.293
p_coapplicant$_{i,t}$	4,264	0.473	0.112	0.127	0.409	0.481	0.551	0.702
p_hrl_n$_{i,t}$	4,264	0.220	0.133	0.026	0.125	0.196	0.281	0.692
p_hrl_am$_{i,t}$	4,264	0.170	0.118	0.013	0.088	0.143	0.218	0.640
Variables Related to High-Risk Loans								
ln(hrl_n)$_{i,t}$	4,264	5.252	2.017	0.693	4.007	5.159	6.468	11.170
ln(hrl_am)$_{i,t}$	4,264	10.120	1.952	5.576	8.896	9.963	11.202	16.492
applincome_hrl$_{i,t}$	4,264	95.348	96.829	0.000	54.275	71.659	101.568	682.000
p_secured_hrl$_{i,t}$	4,264	0.917	0.129	0.333	0.885	0.976	1.000	1.000
p_male_hrl$_{i,t}$	4,264	0.645	0.114	0.200	0.590	0.654	0.710	1.000
p_white_hrl$_{i,t}$	4,264	0.773	0.182	0.000	0.693	0.813	0.901	1.000
p_latino_hrl$_{i,t}$	4,264	0.061	0.086	0.000	0.009	0.031	0.074	0.455
p_coapplicant_hrl$_{i,t}$	4,264	0.424	0.121	0.000	0.357	0.428	0.497	0.750

Panel B: Subsamples

	After = 0 (2004-2006)			*After* = 1 (2010-2017)			
Variable	**Count**	**Mean**	**SD.**	**Count**	**Mean**	**SD.**	**Diff.**
AS_Total$_{i,t-1}$	1,157	0.108	0.311	2,107	0.120	0.325	-0.012
AS_Real$_{i,t-1}$	1,157	0.088	0.284	2,107	0.101	0.302	-0.013
TCR$_{i,t-1}$	1,157	0.136	0.029	2,107	0.149	0.032	-0.014***
ROA$_{i,t-1}$	1,157	0.011	0.005	2,107	0.005	0.011	0.006***
LEV$_{i,t-1}$	1,157	0.094	0.021	2,107	0.103	0.025	-0.009***
LIQR$_{i,t-1}$	1,157	0.254	0.113	2,107	0.255	0.100	-0.001
SIZE$_{i,t-1}$	1,157	14.359	1.558	2,107	15.105	1.642	-0.746***
Δln(Loan_Total)$_{i,t-1}$	1,157	0.136	0.136	2,107	0.060	0.145	0.076***
Δln(Loan_Real)$_{i,t-1}$	1,157	0.156	0.152	2,107	0.058	0.156	0.098***
NPLR_Total$_{i,t-1}$	1,157	0.007	0.008	2,107	0.024	0.022	-0.017***
NPLR_Real$_{i,t-1}$	1,157	0.003	0.004	2,107	0.028	0.027	-0.026***
NCOR_Total$_{i,t-1}$	1,157	0.003	0.004	2,107	0.008	0.011	-0.006***
NCOR_Real$_{i,t-1}$	1,157	0.000	0.001	2,107	0.008	0.011	-0.007***
ΔGDP$_{t-1}$	1,157	0.034	0.004	2,107	0.015	0.017	0.019***
ΔFedFundR$_{t-1}$	1,157	0.009	0.009	2,107	0.000	0.001	0.009***
APR_N$_{i,t}$	1,157	0.803	0.116	2,107	0.734	0.124	0.069***
APR_AM$_{i,t}$	1,157	0.829	0.117	2,107	0.765	0.124	0.063***
HR_APR_N$_{i,t}$	1,157	0.332	0.274	2,107	0.174	0.207	0.158***

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HR_APR_AM$_{i,t}$	1,157	0.332	0.294	2,107	0.170	0.221	0.162***
NHR_APR_N$_{i,t}$	1,157	0.914	0.086	2,107	0.873	0.094	0.041***
NHR_APR_AM$_{i,t}$	1,157	0.907	0.097	2,107	0.873	0.100	0.034***
DENY_N$_{i,t}$	1,157	0.130	0.095	2,107	0.168	0.098	-0.038***
DENY_AM$_{i,t}$	1,157	0.095	0.081	2,107	0.131	0.087	-0.036***
ltir$_{i,t}$	1,157	1.726	0.632	2,107	2.078	0.684	-0.352***
ln(loan_n)$_{i,t}$	1,157	6.655	1.767	2,107	7.189	1.849	-0.533***
ln(loan_am)$_{i,t}$	1,157	11.576	1.680	2,107	12.543	1.807	-0.967***
applincome_total$_{i,t}$	1,157	114.181	87.619	2,107	138.773	94.189	-24.591***
p_secured$_{i,t}$	1,157	0.942	0.088	2,107	0.941	0.092	0.000
p_male$_{i,t}$	1,157	0.675	0.102	2,107	0.645	0.108	0.030***
p_white$_{i,t}$	1,157	0.798	0.163	2,107	0.765	0.176	0.033***
p_latino$_{i,t}$	1,157	0.045	0.063	2,107	0.038	0.047	0.007***
p_coapplicant$_{i,t}$	1,157	0.499	0.115	2,107	0.458	0.105	0.041***
p_hrl_n$_{i,t}$	1,157	0.213	0.141	2,107	0.212	0.125	0.001
p_hrl_am$_{i,t}$	1,157	0.159	0.127	2,107	0.165	0.108	-0.006
ln(hrl_n)$_{i,t}$	1,157	4.877	2.023	2,107	5.459	2.011	-0.582***
ln(hrl_am)$_{i,t}$	1,157	9.426	1.893	2,107	10.519	1.932	-1.094***
applincome_hrl$_{i,t}$	1,157	79.611	86.002	2,107	98.052	95.514	-18.441***
p_secured_hrl$_{i,t}$	1,157	0.923	0.118	2,107	0.909	0.138	0.014***
p_male_hrl$_{i,t}$	1,157	0.647	0.124	2,107	0.640	0.108	0.007*
p_white_hrl$_{i,t}$	1,157	0.772	0.189	2,107	0.768	0.177	0.004
p_latino_hrl$_{i,t}$	1,157	0.071	0.102	2,107	0.056	0.076	0.015***
p_coapplicant_hrl$_{i,t}$	1,157	0.431	0.132	2,107	0.412	0.114	0.019***

[a] The definitions of variables are provided in the Variable Definitions part of the Appendix.
[b] For variables *After*, # of obs. = 1,157 during 2004-2006 and # of obs. = 2,107 during 2010-2017.
[c] For variables *After_6789*, # of obs. = 804 during 2004-2005 and # of obs. = 2,107 during 2010-2017.
[d] For variables *After_7890*, # of obs. = 1,157 during 2004-2006 and # of obs. = 1,797 during 2011-2017.
[e] For variables *After_67890*, # of obs. = 804 during 2004-2005 and # of obs. = 1,797 during 2011-2017.
[f] Difference between the means of the two groups (*After* = 0 vs. *After* = 1) is estimated by independent group *t*-tests.
[g] Statistical significance levels for the difference are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

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Table 3 Effect of Total Asset Securitization on Loan Approval Before and After the Crisis

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Total_{i,t-1}$	H1	(–)	-0.0328**	-0.0346**	-0.0811***	-0.0690**	-0.0200	-0.0250
			(-2.129)	(-1.993)	(-2.759)	(-2.156)	(-1.178)	(-1.496)
After	H2	(–)	-0.0607***	-0.0719***	-0.0814***	-0.0655***	-0.0365***	-0.0377***
			(-6.348)	(-6.250)	(-4.117)	(-2.760)	(-3.925)	(-3.554)
$After \times AS\_Total_{i,t-1}$	H3	(+)	0.0398**	0.0398*	0.0959***	0.0871***	0.0231	0.0216
			(2.276)	(1.955)	(3.388)	(2.819)	(1.129)	(1.028)
$TCR_{i,t-1}$			-0.0414	-0.0735	-0.2860	-0.4763	-0.0670	-0.1239
			(-0.309)	(-0.513)	(-0.996)	(-1.446)	(-0.566)	(-0.977)
$ROA_{i,t-1}$			0.2726	0.2966	0.9221*	1.0560*	0.1651	0.1545
			(1.149)	(1.080)	(1.738)	(1.892)	(0.643)	(0.541)
$LEV_{i,t-1}$			-0.0062	-0.0653	0.2080	0.2005	-0.0188	0.0407
			(-0.039)	(-0.368)	(0.538)	(0.474)	(-0.120)	(0.227)
$LIQR_{i,t-1}$			-0.0531	-0.0465	-0.2395***	-0.2076**	-0.0033	0.0107
			(-1.287)	(-1.026)	(-2.706)	(-2.255)	(-0.083)	(0.239)
$SIZE_{i,t-1}$			0.0017	0.0080	-0.0152	-0.0380*	0.0033	0.0036
			(0.202)	(0.839)	(-0.740)	(-1.753)	(0.390)	(0.403)
$\Delta ln(Loan\_Total)_{i,t-1}$			0.0171	0.0102	0.0767***	0.0897***	-0.0057	-0.0083
			(1.467)	(0.791)	(2.992)	(3.040)	(-0.505)	(-0.627)
$NPLR\_Total_{i,t-1}$			-0.2162	-0.3474*	-0.4519	-0.3847	-0.0560	-0.0557
			(-1.374)	(-1.961)	(-1.600)	(-1.168)	(-0.361)	(-0.316)
Intercept			0.8037***	0.7742***	0.4742*	0.9965***	1.0697***	0.9447***
			(6.230)	(5.039)	(1.696)	(3.295)	(8.657)	(6.950)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			3,264	3,264	3,264	3,264	3,264	3,264
R^2			0.381	0.261	0.307	0.301	0.133	0.086
Adjusted R^2			0.377	0.256	0.302	0.296	0.127	0.080

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Table 4 Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Real_{i,t-1}$	H1	(–)	-0.0312*	-0.0377	-0.0614**	-0.0410	-0.0208	-0.0271
			(-1.805)	(-1.594)	(-2.200)	(-1.308)	(-0.936)	(-1.125)
After	H2	(–)	-0.0595***	-0.0704***	-0.0780***	-0.0614**	-0.0357***	-0.0375***
			(-6.221)	(-6.076)	(-3.884)	(-2.556)	(-3.856)	(-3.507)
$After \times AS\_Real_{i,t-1}$	H3	(+)	0.0309*	0.0303	0.0957***	0.0880**	0.0072	0.0086
			(1.871)	(1.593)	(3.186)	(2.568)	(0.416)	(0.464)
$TCR_{i,t-1}$			-0.0484	-0.0740	-0.2901	-0.4814	-0.0749	-0.1306
			(-0.362)	(-0.517)	(-1.009)	(-1.463)	(-0.633)	(-1.028)
$ROA_{i,t-1}$			0.2711	0.2831	0.9073*	1.0413*	0.1652	0.1581
			(1.135)	(1.030)	(1.715)	(1.873)	(0.640)	(0.552)
$LEV_{i,t-1}$			0.0166	-0.0492	0.2304	0.2244	0.0089	0.0626
			(0.104)	(-0.275)	(0.595)	(0.531)	(0.057)	(0.347)
$LIQR_{i,t-1}$			-0.0510	-0.0434	-0.2365***	-0.2052**	-0.0011	0.0122
			(-1.239)	(-0.957)	(-2.687)	(-2.244)	(-0.027)	(0.273)
$SIZE_{i,t-1}$			0.0025	0.0087	-0.0145	-0.0379*	0.0040	0.0045
			(0.294)	(0.906)	(-0.713)	(-1.751)	(0.476)	(0.503)
$\Delta ln(Loan\_Real)_{i,t-1}$			0.0148	0.0139	0.0721***	0.0823***	-0.0067	-0.0092
			(1.440)	(1.230)	(3.209)	(3.194)	(-0.667)	(-0.792)
$NPLR\_Real_{i,t-1}$			-0.2156	-0.3353*	-0.4748*	-0.4219	-0.0453	-0.0417
			(-1.377)	(-1.905)	(-1.688)	(-1.282)	(-0.294)	(-0.238)
Intercept			0.7850***	0.7575***	0.4529	0.9832***	1.0530***	0.9267***
			(5.869)	(4.829)	(1.627)	(3.249)	(8.199)	(6.662)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			3,264	3,264	3,264	3,264	3,264	3,264
R^2			0.379	0.260	0.306	0.300	0.132	0.087
Adjusted R^2			0.375	0.255	0.301	0.296	0.126	0.080

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $in(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Table 5 Robustness Test: Using Overall Net Charge-Off Ratio as Proxy for Credit Risk

Panel A: Effect of Total Asset Securitization on Loan Approval Before and After the Crisis

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Total_{i,t-1}$	H1	(–)	-0.0329**	-0.0342*	-0.0795***	-0.0673**	-0.0206	-0.0254
			(-2.121)	(-1.948)	(-2.727)	(-2.116)	(-1.209)	(-1.520)
After	H2	(–)	-0.0640***	-0.0758***	-0.0845***	-0.0677***	-0.0386***	-0.0396***
			(-6.829)	(-6.738)	(-4.437)	(-2.947)	(-4.297)	(-3.856)
$After \times AS\_Total_{i,t-1}$	H3	(+)	0.0397**	0.0394*	0.0949***	0.0863***	0.0233	0.0218
			(2.259)	(1.920)	(3.375)	(2.808)	(1.136)	(1.034)
$TCR_{i,t-1}$			-0.0801	-0.1114	-0.2991	-0.4743	-0.0989	-0.1525
			(-0.619)	(-0.822)	(-1.085)	(-1.510)	(-0.851)	(-1.226)
$ROA_{i,t-1}$			0.5334*	0.3295	0.3888	0.4010	0.5777*	0.5172
			(1.774)	(0.959)	(0.629)	(0.605)	(1.928)	(1.466)
$LEV_{i,t-1}$			0.0393	-0.0140	0.2416	0.2163	0.0126	0.0692
			(0.249)	(-0.081)	(0.645)	(0.533)	(0.081)	(0.388)
$LIQR_{i,t-1}$			-0.0497	-0.0433	-0.2386***	-0.2077**	-0.0004	0.0133
			(-1.205)	(-0.955)	(-2.711)	(-2.272)	(-0.009)	(0.297)
$SIZE_{i,t-1}$			0.0012	0.0072	-0.0162	-0.0392*	0.0032	0.0035
			(0.149)	(0.765)	(-0.796)	(-1.807)	(0.383)	(0.395)
$\Delta ln(Loan\_Total)_{i,t-1}$			0.0216*	0.0102	0.0657**	0.0765**	0.0021	-0.0015
			(1.736)	(0.722)	(2.495)	(2.544)	(0.175)	(-0.104)
$NCOR\_Total_{i,t-1}$			0.1386	-0.3835	-1.4046**	-1.5046**	0.5775**	0.4996
			(0.410)	(-1.038)	(-2.160)	(-2.177)	(1.989)	(1.388)
Intercept			0.7961***	0.7730***	0.4908*	1.0178***	1.0578***	0.9342***
			(6.180)	(5.058)	(1.761)	(3.364)	(8.568)	(6.894)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			3,264	3,264	3,264	3,264	3,264	3,264
R^2			0.380	0.259	0.307	0.302	0.135	0.087
Adjusted R^2			0.376	0.254	0.303	0.297	0.129	0.081

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.

[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.

[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.

[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel B: Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Real_{i,t-1}$	H1	(–)	-0.0319*	-0.0379	-0.0601**	-0.0393	-0.0219	-0.0280
			(-1.835)	(-1.586)	(-2.162)	(-1.258)	(-0.979)	(-1.158)
After	H2	(–)	-0.0628***	-0.0744***	-0.0814***	-0.0640***	-0.0376***	-0.0392***
			(-6.736)	(-6.576)	(-4.219)	(-2.760)	(-4.231)	(-3.796)
$After \times AS\_Real_{i,t-1}$	H3	(+)	0.0307*	0.0299	0.0947***	0.0870**	0.0074	0.0087
			(1.854)	(1.558)	(3.181)	(2.563)	(0.426)	(0.472)
$TCR_{i,t-1}$			-0.0886	-0.1121	-0.3007	-0.4768	-0.1082	-0.1601
			(-0.686)	(-0.826)	(-1.094)	(-1.525)	(-0.930)	(-1.281)
$ROA_{i,t-1}$			0.5237*	0.3263	0.3481	0.3499	0.5745*	0.5186
			(1.741)	(0.950)	(0.562)	(0.527)	(1.906)	(1.467)
$LEV_{i,t-1}$			0.0636	0.0016	0.2621	0.2387	0.0416	0.0916
			(0.405)	(0.009)	(0.700)	(0.591)	(0.265)	(0.510)
$LIQR_{i,t-1}$			-0.0476	-0.0403	-0.2357***	-0.2053**	0.0018	0.0147
			(-1.158)	(-0.887)	(-2.693)	(-2.260)	(0.045)	(0.328)
$SIZE_{i,t-1}$			0.0021	0.0080	-0.0158	-0.0393*	0.0041	0.0046
			(0.253)	(0.841)	(-0.776)	(-1.815)	(0.487)	(0.511)
$\Delta ln(Loan\_Real)_{i,t-1}$			0.0178*	0.0136	0.0628***	0.0713***	-0.0009	-0.0041
			(1.662)	(1.123)	(2.772)	(2.744)	(-0.093)	(-0.333)
$NCOR\_Real_{i,t-1}$			0.1199	-0.3546	-1.4631**	-1.5944**	0.5764**	0.5054
			(0.361)	(-0.970)	(-2.289)	(-2.336)	(2.003)	(1.409)
Intercept			0.7763***	0.7556***	0.4727*	1.0087***	1.0393***	0.9147***
			(5.807)	(4.837)	(1.702)	(3.329)	(8.086)	(6.589)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			3,264	3,264	3,264	3,264	3,264	3,264
R^2			0.378	0.258	0.306	0.302	0.134	0.088
Adjusted R^2			0.374	0.253	0.302	0.297	0.128	0.082

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Table 6 Robustness Test: Redefining the Pre-Crisis and the Post-Crisis Periods

Panel A: Effect of Total Asset Securitization on Loan Approval Before and After the Crisis (2004-2005 vs. 2010-2017)

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Total_{i,t-1}$	H1	(–)	-0.0308**	-0.0337*	-0.0817***	-0.0731**	-0.0178	-0.0244
			(-2.065)	(-1.830)	(-2.655)	(-2.134)	(-1.108)	(-1.429)
After_6789	H2	(–)	-0.0589***	-0.0706***	-0.0728***	-0.0576**	-0.0363***	-0.0373***
			(-6.248)	(-6.064)	(-3.756)	(-2.430)	(-3.959)	(-3.417)
$After\_6789 \times AS\_Total_{i,t-1}$	H3	(+)	0.0399**	0.0399*	0.1004***	0.0945***	0.0223	0.0229
			(2.337)	(1.884)	(3.430)	(2.924)	(1.122)	(1.069)
$TCR_{i,t-1}$			-0.0284	-0.0442	-0.3423	-0.4988	-0.0656	-0.1143
			(-0.210)	(-0.312)	(-1.180)	(-1.478)	(-0.552)	(-0.900)
$ROA_{i,t-1}$			0.3151	0.3357	0.8636	0.8616	0.2247	0.2091
			(1.311)	(1.163)	(1.618)	(1.503)	(0.873)	(0.706)
$LEV_{i,t-1}$			-0.0227	-0.1016	0.4136	0.3573	-0.0158	0.0415
			(-0.132)	(-0.547)	(1.027)	(0.786)	(-0.098)	(0.226)
$LIQR_{i,t-1}$			-0.0532	-0.0393	-0.2263***	-0.1860**	-0.0054	0.0103
			(-1.265)	(-0.851)	(-2.616)	(-2.025)	(-0.135)	(0.223)
$SIZE_{i,t-1}$			0.0003	0.0068	-0.0138	-0.0348	0.0003	0.0020
			(0.032)	(0.692)	(-0.663)	(-1.546)	(0.043)	(0.224)
$\Delta ln(Loan\_Total)_{i,t-1}$			0.0201	0.0155	0.0667***	0.0824***	-0.0002	-0.0005
			(1.640)	(1.132)	(2.642)	(2.710)	(-0.020)	(-0.035)
$NPLR\_Total_{i,t-1}$			-0.2003	-0.3772**	-0.4228	-0.4009	-0.0224	-0.0561
			(-1.294)	(-2.153)	(-1.422)	(-1.176)	(-0.154)	(-0.330)
Intercept			0.8858***	0.8536***	0.4927*	0.9792***	1.1265***	0.9829***
			(7.127)	(5.406)	(1.785)	(3.160)	(9.677)	(7.011)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			2,911	2,911	2,911	2,911	2,911	2,911
R^2			0.399	0.270	0.279	0.261	0.145	0.098
Adjusted R^2			0.394	0.264	0.274	0.256	0.138	0.091

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.

[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.

[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.

[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel B: Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis (2004-2005 vs. 2010-2017)

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Real_{i,t-1}$	H1	(–)	-0.0324*	-0.0368	-0.0575**	-0.0408	-0.0206	-0.0257
			(-1.772)	(-1.457)	(-1.997)	(-1.224)	(-0.914)	(-1.022)
After_6789	H2	(–)	-0.0578***	-0.0691***	-0.0681***	-0.0522**	-0.0358***	-0.0367***
			(-6.095)	(-5.876)	(-3.452)	(-2.171)	(-3.881)	(-3.338)
$After\_6789 \times AS\_Real_{i,t-1}$	H3	(+)	0.0354**	0.0329	0.1001***	0.0952***	0.0105	0.0119
			(1.979)	(1.536)	(3.273)	(2.714)	(0.550)	(0.572)
$TCR_{i,t-1}$			-0.0408	-0.0507	-0.3508	-0.5073	-0.0782	-0.1222
			(-0.303)	(-0.359)	(-1.212)	(-1.510)	(-0.661)	(-0.964)
$ROA_{i,t-1}$			0.3173	0.3245	0.8431	0.8398	0.2279	0.2073
			(1.309)	(1.125)	(1.588)	(1.475)	(0.880)	(0.698)
$LEV_{i,t-1}$			0.0032	-0.0787	0.4464	0.3898	0.0142	0.0657
			(0.018)	(-0.421)	(1.109)	(0.861)	(0.088)	(0.355)
$LIQR_{i,t-1}$			-0.0512	-0.0364	-0.2216**	-0.1812**	-0.0035	0.0121
			(-1.220)	(-0.788)	(-2.576)	(-1.985)	(-0.087)	(0.260)
$SIZE_{i,t-1}$			0.0008	0.0071	-0.0141	-0.0356	0.0009	0.0025
			(0.102)	(0.733)	(-0.688)	(-1.593)	(0.120)	(0.283)
$\Delta ln(Loan\_Real)_{i,t-1}$			0.0171	0.0177	0.0668***	0.0811***	-0.0029	-0.0007
			(1.581)	(1.469)	(3.028)	(3.071)	(-0.273)	(-0.056)
$NPLR\_Real_{i,t-1}$			-0.2024	-0.3700**	-0.4432	-0.4328	-0.0158	-0.0455
			(-1.311)	(-2.117)	(-1.497)	(-1.271)	(-0.109)	(-0.268)
Intercept			0.8728***	0.8424***	0.4860*	0.9793***	1.1138***	0.9705***
			(6.936)	(5.297)	(1.777)	(3.171)	(9.417)	(6.876)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			2,911	2,911	2,911	2,911	2,911	2,911
R^2			0.398	0.269	0.278	0.261	0.144	0.098
Adjusted R^2			0.393	0.263	0.273	0.256	0.138	0.091

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.

[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.

[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.

[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel C: Effect of Total Asset Securitization on Loan Approval Before and After the Crisis (2004-2006 vs. 2011-2017)

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Total_{i,t-1}$	H1	(–)	-0.0344**	-0.0339**	-0.0795***	-0.0665**	-0.0223	-0.0259
			(-2.243)	(-1.984)	(-2.695)	(-2.077)	(-1.330)	(-1.584)
After_7890	H2	(–)	-0.0604***	-0.0723***	-0.0804***	-0.0700***	-0.0381***	-0.0406***
			(-6.146)	(-6.085)	(-3.807)	(-2.817)	(-4.092)	(-3.847)
$After\_7890 \times AS\_Total_{i,t-1}$	H3	(+)	0.0384**	0.0371*	0.0945***	0.0850**	0.0202	0.0169
			(2.144)	(1.764)	(3.104)	(2.525)	(0.957)	(0.781)
$TCR_{i,t-1}$			-0.0759	-0.0675	-0.1621	-0.3671	-0.1119	-0.1282
			(-0.527)	(-0.434)	(-0.525)	(-1.038)	(-0.925)	(-0.995)
$ROA_{i,t-1}$			0.3005	0.1572	1.0399	0.9992	0.1314	-0.0808
			(1.096)	(0.490)	(1.631)	(1.415)	(0.449)	(-0.281)
$LEV_{i,t-1}$			-0.0167	-0.1049	0.0814	0.0255	-0.0291	0.0056
			(-0.098)	(-0.554)	(0.197)	(0.056)	(-0.183)	(0.031)
$LIQR_{i,t-1}$			-0.0448	-0.0341	-0.2347**	-0.2008**	0.0062	0.0213
			(-1.031)	(-0.712)	(-2.406)	(-1.970)	(0.150)	(0.468)
$SIZE_{i,t-1}$			0.0042	0.0127	-0.0124	-0.0343	0.0055	0.0070
			(0.506)	(1.329)	(-0.580)	(-1.544)	(0.644)	(0.781)
$\Delta ln(Loan\_Total)_{i,t-1}$			0.0164	0.0073	0.0706***	0.0776**	-0.0026	-0.0067
			(1.384)	(0.540)	(2.636)	(2.549)	(-0.235)	(-0.512)
$NPLR\_Total_{i,t-1}$			-0.2750	-0.4871**	-0.5803*	-0.5642	-0.0789	-0.1430
			(-1.536)	(-2.494)	(-1.836)	(-1.537)	(-0.459)	(-0.748)
Intercept			0.7624***	0.6897***	0.3873	0.9503***	1.0553***	0.9128***
			(5.694)	(4.279)	(1.338)	(3.043)	(8.306)	(6.695)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			2,954	2,954	2,954	2,954	2,954	2,954
R^2			0.383	0.264	0.320	0.306	0.148	0.096
Adjusted R^2			0.378	0.258	0.315	0.301	0.142	0.090

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel D: Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis (2004-2006 vs. 2011-2017)

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Real_{i,t-1}$	H1	(–)	-0.0340*	-0.0369	-0.0625**	-0.0396	-0.0233	-0.0272
			(-1.963)	(-1.565)	(-2.123)	(-1.223)	(-1.062)	(-1.153)
After_7890	H2	(–)	-0.0594***	-0.0711***	-0.0774***	-0.0665***	-0.0374***	-0.0404***
			(-6.037)	(-5.919)	(-3.613)	(-2.646)	(-4.001)	(-3.783)
$After\_7890 \times AS\_Real_{i,t-1}$	H3	(+)	0.0299*	0.0276	0.0907***	0.0827**	0.0047	0.0043
			(1.762)	(1.426)	(2.817)	(2.253)	(0.266)	(0.234)
$TCR_{i,t-1}$			-0.0882	-0.0709	-0.1716	-0.3727	-0.1269	-0.1396
			(-0.612)	(-0.455)	(-0.556)	(-1.057)	(-1.048)	(-1.081)
$ROA_{i,t-1}$			0.3128	0.1591	1.0217	0.9663	0.1519	-0.0616
			(1.134)	(0.495)	(1.606)	(1.371)	(0.516)	(-0.214)
$LEV_{i,t-1}$			0.0110	-0.0863	0.1159	0.0566	0.0053	0.0318
			(0.065)	(-0.454)	(0.280)	(0.125)	(0.033)	(0.174)
$LIQR_{i,t-1}$			-0.0425	-0.0310	-0.2306**	-0.1976*	0.0084	0.0225
			(-0.981)	(-0.646)	(-2.374)	(-1.950)	(0.203)	(0.491)
$SIZE_{i,t-1}$			0.0053	0.0136	-0.0112	-0.0340	0.0065	0.0080
			(0.626)	(1.417)	(-0.525)	(-1.528)	(0.764)	(0.904)
$\Delta ln(Loan\_Real)_{i,t-1}$			0.0111	0.0090	0.0631***	0.0701***	-0.0081	-0.0110
			(1.077)	(0.781)	(2.773)	(2.697)	(-0.822)	(-0.988)
$NPLR\_Real_{i,t-1}$			-0.2768	-0.4747**	-0.6085*	-0.6069*	-0.0724	-0.1324
			(-1.555)	(-2.452)	(-1.936)	(-1.654)	(-0.426)	(-0.698)
Intercept			0.7391***	0.6705***	0.3589	0.9344***	1.0345***	0.8924***
			(5.299)	(4.064)	(1.239)	(2.983)	(7.797)	(6.364)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			2,954	2,954	2,954	2,954	2,954	2,954
R^2			0.381	0.263	0.318	0.305	0.149	0.097
Adjusted R^2			0.376	0.257	0.313	0.300	0.142	0.091

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel E: Effect of Total Asset Securitization on Loan Approval Before and After the Crisis (2004-2005 vs. 2011-2017)

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Total_{i,t-1}$	H1	(–)	-0.0328**	-0.0332*	-0.0829***	-0.0706**	-0.0207	-0.0260
			(-2.191)	(-1.816)	(-2.688)	(-2.043)	(-1.324)	(-1.551)
After_67890	H2	(–)	-0.0587***	-0.0717***	-0.0736***	-0.0602**	-0.0381***	-0.0405***
			(-6.062)	(-5.895)	(-3.570)	(-2.413)	(-4.132)	(-3.665)
$After\_67890 \times AS\_Total_{i,t-1}$	H3	(+)	0.0384**	0.0372*	0.1006***	0.0926***	0.0194	0.0181
			(2.153)	(1.675)	(3.165)	(2.616)	(0.931)	(0.811)
$TCR_{i,t-1}$			-0.0654	-0.0373	-0.2692	-0.4358	-0.1119	-0.1116
			(-0.451)	(-0.244)	(-0.865)	(-1.202)	(-0.942)	(-0.885)
$ROA_{i,t-1}$			0.3581	0.2065	0.8771	0.7264	0.2270	-0.0057
			(1.298)	(0.600)	(1.416)	(1.002)	(0.777)	(-0.019)
$LEV_{i,t-1}$			-0.0400	-0.1541	0.3641	0.2514	-0.0360	-0.0131
			(-0.217)	(-0.754)	(0.838)	(0.509)	(-0.220)	(-0.069)
$LIQR_{i,t-1}$			-0.0435	-0.0250	-0.2290**	-0.1842*	0.0078	0.0243
			(-0.973)	(-0.509)	(-2.406)	(-1.784)	(0.187)	(0.512)
$SIZE_{i,t-1}$			0.0034	0.0118	-0.0150	-0.0333	0.0030	0.0056
			(0.430)	(1.217)	(-0.687)	(-1.443)	(0.389)	(0.640)
$\Delta ln(Loan\_Total)_{i,t-1}$			0.0196	0.0130	0.0511*	0.0602*	0.0035	0.0026
			(1.575)	(0.929)	(1.942)	(1.915)	(0.303)	(0.192)
$NPLR\_Total_{i,t-1}$			-0.2542	-0.5170***	-0.5695*	-0.6034	-0.0307	-0.1337
			(-1.434)	(-2.681)	(-1.711)	(-1.575)	(-0.189)	(-0.721)
Intercept			0.8465***	0.7837***	0.4666	0.9613***	1.1155***	0.9612***
			(6.666)	(4.797)	(1.625)	(2.997)	(9.509)	(6.921)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			2,601	2,601	2,601	2,601	2,601	2,601
R^2			0.411	0.282	0.297	0.266	0.169	0.116
Adjusted R^2			0.406	0.276	0.291	0.260	0.162	0.109

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel F: Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis (2004-2005 vs. 2011-2017)

Dependent Variable	Hypothesis	Prediction	(1) *APR_N*	(2) *APR_AM*	(3) *HR_APR_N*	(4) *HR_APR_AM*	(5) *NHR_APR_N*	(6) *NHR_APR_AM*
$AS\_Real_{i,t-1}$	H1	(–)	-0.0351*	-0.0354	-0.0569*	-0.0367	-0.0237	-0.0258
			(-1.904)	(-1.394)	(-1.874)	(-1.063)	(-1.061)	(-1.039)
After_67890	H2	(–)	-0.0580***	-0.0704***	-0.0694***	-0.0553**	-0.0379***	-0.0401***
			(-5.936)	(-5.728)	(-3.299)	(-2.187)	(-4.058)	(-3.594)
$After\_67890 \times AS\_Real_{i,t-1}$	H3	(+)	0.0340*	0.0296	0.0933***	0.0881**	0.0077	0.0071
			(1.844)	(1.350)	(2.834)	(2.336)	(0.398)	(0.337)
$TCR_{i,t-1}$			-0.0828	-0.0461	-0.2815	-0.4416	-0.1319	-0.1234
			(-0.573)	(-0.302)	(-0.908)	(-1.227)	(-1.117)	(-0.983)
$ROA_{i,t-1}$			0.3746	0.2094	0.8509	0.6836	0.2514	0.0069
			(1.348)	(0.609)	(1.375)	(0.944)	(0.856)	(0.023)
$LEV_{i,t-1}$			-0.0084	-0.1273	0.4127	0.2909	0.0021	0.0161
			(-0.046)	(-0.621)	(0.953)	(0.593)	(0.013)	(0.084)
$LIQR_{i,t-1}$			-0.0415	-0.0222	-0.2242**	-0.1795*	0.0095	0.0255
			(-0.931)	(-0.453)	(-2.366)	(-1.749)	(0.230)	(0.537)
$SIZE_{i,t-1}$			0.0043	0.0124	-0.0149	-0.0341	0.0039	0.0063
			(0.533)	(1.280)	(-0.688)	(-1.479)	(0.509)	(0.728)
$\Delta ln(Loan\_Real)_{i,t-1}$			0.0135	0.0129	0.0495**	0.0606**	-0.0038	-0.0012
			(1.247)	(1.079)	(2.224)	(2.266)	(-0.372)	(-0.103)
$NPLR\_Real_{i,t-1}$			-0.2575	-0.5095***	-0.5901*	-0.6344*	-0.0277	-0.1262
			(-1.459)	(-2.653)	(-1.785)	(-1.659)	(-0.172)	(-0.683)
Intercept			0.8291***	0.7694***	0.4549	0.9611***	1.0982***	0.9454***
			(6.427)	(4.658)	(1.587)	(2.997)	(9.171)	(6.731)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			2,601	2,601	2,601	2,601	2,601	2,601
R^2			0.409	0.282	0.295	0.266	0.169	0.117
Adjusted R^2			0.404	0.275	0.289	0.260	0.162	0.109

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Table 7 Robustness Test: Using Full Sample through Adding the Crisis Variable

Panel A: Effect of Total Asset Securitization on Loan Approval Before and After the Crisis

Dependent Variable	Hypothesis	Prediction	(1) *APR N*	(2) *APR AM*	(3) *HR APR N*	(4) *HR APR AM*	(5) *NHR APR N*	(6) *NHR APR AM*
$AS\ Total_{i,t-1}$	H1	(–)	-0.0332**	-0.0354**	-0.0783***	-0.0702**	-0.0196	-0.0235
			(-2.165)	(-2.039)	(-2.963)	(-2.539)	(-1.177)	(-1.423)
After	H2	(–)	-0.0545***	-0.0537***	-0.1091***	-0.0960***	-0.0256***	-0.0208**
			(-6.999)	(-6.057)	(-6.636)	(-4.954)	(-3.355)	(-2.524)
CRISIS			-0.0181***	-0.0306***	0.0142	0.0210	-0.0086*	-0.0140***
			(-3.491)	(-5.128)	(1.382)	(1.631)	(-1.788)	(-2.594)
$After \times AS\ Total_{i,t-1}$	H3	(+)	0.0354**	0.0361*	0.0934***	0.0838***	0.0178	0.0172
			(2.134)	(1.876)	(3.470)	(2.909)	(0.933)	(0.886)
$CRISIS \times AS\_Total_{i,t-1}$			0.0110	0.0066	0.0167	0.0090	0.0141	0.0105
			(0.709)	(0.339)	(0.736)	(0.352)	(0.842)	(0.561)
$TCR_{i,t-1}$			-0.1738	-0.2109*	-0.3133	-0.4784*	-0.2160**	-0.2340**
			(-1.509)	(-1.734)	(-1.236)	(-1.709)	(-2.131)	(-2.119)
$ROA_{i,t-1}$			0.3059	0.4165	0.9581**	0.9429*	0.2764	0.3057
			(1.244)	(1.551)	(1.983)	(1.900)	(1.113)	(1.082)
$LEV_{i,t-1}$			0.1916	0.1635	0.0847	0.0594	0.1912	0.2268
			(1.398)	(1.120)	(0.253)	(0.165)	(1.454)	(1.550)
$LIQR_{i,t-1}$			-0.0160	-0.0132	-0.2082***	-0.1675**	0.0283	0.0258
			(-0.436)	(-0.340)	(-2.636)	(-2.092)	(0.799)	(0.676)
$SIZE_{i,t-1}$			-0.0010	0.0020	0.0102	-0.0095	-0.0030	-0.0018
			(-0.121)	(0.220)	(0.567)	(-0.470)	(-0.375)	(-0.213)
$\Delta ln(Loan\ Total)_{i,t-1}$			0.0114	0.0112	0.0609***	0.0747***	-0.0077	-0.0057
			(1.089)	(0.976)	(2.590)	(2.674)	(-0.756)	(-0.479)
$NPLR\ Total_{i,t-1}$			-0.1476	-0.2345	-0.5230**	-0.4510	0.0460	0.0306
			(-0.960)	(-1.403)	(-2.091)	(-1.545)	(0.308)	(0.186)
Intercept			0.8347***	0.9011***	0.1014	0.5939**	1.1775***	1.0460***
			(6.547)	(6.528)	(0.404)	(2.054)	(9.449)	(8.208)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			4,264	4,264	4,264	4,264	4,264	4,264
R^2			0.328	0.216	0.327	0.309	0.118	0.068
Adjusted R^2			0.324	0.211	0.324	0.305	0.113	0.063

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.

[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.

[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.

[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Panel B: Effect of Real Estate Secured Asset Securitization on Loan Approval Before and After the Crisis

Dependent Variable	Hypothesis	Prediction	(1) *APR N*	(2) *APR AM*	(3) *HR APR N*	(4) *HR APR AM*	(5) *NHR APR N*	(6) *NHR APR AM*
$AS\ Real_{i,t-1}$	H1	(–)	-0.0305*	-0.0341	-0.0575**	-0.0423	-0.0191	-0.0231
			(-1.855)	(-1.544)	(-2.286)	(-1.528)	(-0.904)	(-0.997)
After	H2	(–)	-0.0534***	-0.0524***	-0.1061***	-0.0928***	-0.0248***	-0.0202**
			(-6.843)	(-5.881)	(-6.432)	(-4.767)	(-3.256)	(-2.438)
CRISIS			-0.0177***	-0.0308***	0.0146	0.0212*	-0.0081*	-0.0140**
			(-3.434)	(-5.112)	(1.423)	(1.655)	(-1.688)	(-2.577)
$After \times AS\ Real_{i,t-1}$	H3	(+)	0.0254	0.0258	0.0847***	0.0757**	0.0029	0.0057
			(1.580)	(1.370)	(3.055)	(2.417)	(0.167)	(0.307)
$CRISIS \times AS\_Real_{i,t-1}$			0.0070	0.0096	0.0203	0.0160	0.0083	0.0103
			(0.408)	(0.465)	(0.872)	(0.593)	(0.499)	(0.563)
$TCR_{i,t-1}$			-0.1756	-0.2106*	-0.3138	-0.4790*	-0.2186**	-0.2350**
			(-1.529)	(-1.736)	(-1.235)	(-1.708)	(-2.166)	(-2.136)
$ROA_{i,t-1}$			0.3078	0.4247	0.9711**	0.9619*	0.2777	0.3130
			(1.238)	(1.566)	(1.999)	(1.926)	(1.111)	(1.100)
$LEV_{i,t-1}$			0.2058	0.1762	0.1060	0.0803	0.2073	0.2384
			(1.506)	(1.205)	(0.315)	(0.223)	(1.579)	(1.634)
$LIQR_{i,t-1}$			-0.0156	-0.0133	-0.2106***	-0.1712**	0.0294	0.0259
			(-0.426)	(-0.341)	(-2.679)	(-2.150)	(0.830)	(0.677)
$SIZE_{i,t-1}$			-0.0002	0.0028	0.0115	-0.0084	-0.0026	-0.0013
			(-0.022)	(0.299)	(0.646)	(-0.415)	(-0.320)	(-0.155)
$\Delta ln(Loan\ Real)_{i,t-1}$			0.0101	0.0114	0.0519**	0.0626**	-0.0072	-0.0052
			(1.043)	(1.099)	(2.533)	(2.561)	(-0.785)	(-0.486)
$NPLR\ Real_{i,t-1}$			-0.1436	-0.2244	-0.5412**	-0.4786	0.0585	0.0447
			(-0.937)	(-1.349)	(-2.164)	(-1.634)	(0.395)	(0.273)
Intercept			0.8166***	0.8841***	0.0744	0.5704**	1.1652***	1.0342***
			(6.248)	(6.243)	(0.297)	(1.971)	(9.217)	(7.972)
$Controls^{Macro}$			Yes	Yes	Yes	Yes	Yes	Yes
$Controls^{Loan}$			Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects			Firm	Firm	Firm	Firm	Firm	Firm
Cluster by Firm			Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.			4,264	4,264	4,264	4,264	4,264	4,264
R^2			0.327	0.214	0.325	0.307	0.118	0.069
Adjusted R^2			0.323	0.210	0.321	0.303	0.113	0.063

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For columns (1), (2), (5) and (6), $Controls^{Loan}$ includes $ltir_{i,t}$, $ln(loan\_n)_{i,t}$, $ln(loan\_am)_{i,t}$, $applincome\_total_{i,t}$, $p\_secured_{i,t}$, $p\_male_{i,t}$, $p\_white_{i,t}$, $p\_latino_{i,t}$, $p\_coapplicant_{i,t}$, and $p\_hrl\_n_{i,t}$; For columns (3) and (4), $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$, $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$.
[e] The definitions of variables are provided in the Variable Definitions part of the Appendix.

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Table 8 Robustness Test: Using Denial Rate as Proxy for Mortgage Lending Behavior

Dependent Variable	Prediction	(1) *DENY_N*	(2) *DENY_AM*	(3) *DENY_N*	(4) *DENY_AM*
$AS\_Total_{i,t-1}$	(+)	0.0183*	0.0133		
		(1.693)	(1.574)		
$AS\_Real_{i,t-1}$	(+)			0.0182	0.0127
				(1.437)	(1.300)
After	(+)	0.0440***	0.0212***	0.0436***	0.0204***
		(6.591)	(3.303)	(6.513)	(3.153)
$After \times AS\_Total_{i,t-1}$	(–)	-0.0293**	-0.0207**		
		(-2.271)	(-2.123)		
$After \times AS\_Real_{i,t-1}$	(–)			-0.0365**	-0.0234**
				(-2.483)	(-2.053)
$TCR_{i,t-1}$		0.0106	-0.0160	0.0128	-0.0181
		(0.103)	(-0.181)	(0.123)	(-0.205)
$ROA_{i,t-1}$		-0.2778*	-0.3346**	-0.2769*	-0.3249**
		(-1.698)	(-2.199)	(-1.693)	(-2.138)
$LEV_{i,t-1}$		0.0094	0.0735	0.0098	0.0742
		(0.073)	(0.655)	(0.076)	(0.661)
$LIQR_{i,t-1}$		0.0369	0.0598**	0.0365	0.0585**
		(1.290)	(2.448)	(1.280)	(2.409)
$SIZE_{i,t-1}$		0.0033	-0.0042	0.0030	-0.0042
		(0.564)	(-0.862)	(0.526)	(-0.853)
$\Delta ln(Loan\_Total)_{i,t-1}$		-0.0216**	-0.0184**		
		(-2.456)	(-2.402)		
$\Delta ln(Loan\_Real)_{i,t-1}$				-0.0196**	-0.0199***
				(-2.492)	(-2.885)
$NPLR\_Total_{i,t-1}$		0.0807	0.2672***		
		(0.762)	(2.836)		
$NPLR\_Real_{i,t-1}$				0.0920	0.2714***
				(0.877)	(2.889)
Intercept		0.2387***	0.0138	0.2429***	0.0154
		(3.116)	(0.197)	(3.181)	(0.218)
$Controls^{Macro}$		Yes	Yes	Yes	Yes
$Controls^{Loan}$		Yes	Yes	Yes	Yes
Fixed Effects		Firm	Firm	Firm	Firm
Cluster by Firm		Yes	Yes	Yes	Yes
# of Obs.		3,264	3,264	3,264	3,264
R^2		0.474	0.569	0.476	0.570
Adjusted R^2		0.471	0.566	0.472	0.567

[a] The regression models include firm fixed effects and are estimated using fixed-effects model.
[b] Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by firm.
[c] *t*-statistics are reported in parentheses below coefficient estimates while *p*-values are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.
[d] For all the columns, $Controls^{Loan}$ includes $p\_hrl\_am_{i,t}$, $ln(hrl\_n)_{i,t}$, $ln(hrl\_am)_{i,t}$, $applincome\_hrl_{i,t}$, $p\_secured\_hrl_{i,t}$, $p\_male\_hrl_{i,t}$,
[e] $p\_white\_hrl_{i,t}$, $p\_latino\_hrl_{i,t}$, and $p\_coapplicant\_hrl_{i,t}$. For all the columns, $Controls^{Macro}$ includes ΔGDP_{t-1} and $\Delta FedFundR_{t-1}$. The definitions of variables are provided in the Variable Definitions part of the Appendix.

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