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The Real Effects of FAS 166/167 on Banks' Mortgage Approval and Sale Decisions

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ABSTRACT

We examine the real effects of FAS 166 and FAS 167 on banks' loan-level mortgage approval and sale decisions. Effective in 2010, these standards tightened the accounting for securitizations and consolidation of securitization entities, respectively, causing banks to recognize an estimated $811 billion of securitized assets on balance sheet. We find that banks that recognize more securitized assets exhibit larger decreases in mortgage approval rates and larger increases in mortgage sale rates. These effects significantly exceed those of banks' off–balance sheet securitized assets, consistent with our results being driven by the consolidation of securitization entities rather than by securitization per se. We conduct tests that help rule out the financial crisis as an alternative explanation for our results. Further analyses suggest that mechanisms underlying the results include consolidating banks' reduced regulatory

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capital adequacy, increased market discipline, and consequent desire not to recognize high-risk mortgages on balance sheet.

JEL codes: G21; M41

Keywords: variable interest entities; consolidation; banks; mortgage approval; mortgage sale

1. Introduction

We examine the real effects of FAS 166 and FAS 167 on the mortgage approval and sale decisions of U.S. commercial bank holding companies (hereafter, "banks").[1] Effective at the beginning of 2010, FAS 166 and FAS 167 tightened the rules governing accounting for securitizations and the consolidation of variable interest entities (VIEs), respectively. Most of banks' VIEs are securitization entities. Under the previous VIE consolidation standard, FIN 46(R), banks rarely consolidated these entities even when they bore most of the entities' risk. We estimate that our sample banks consolidated VIEs holding assets of $811 billion, 5.6% of the total assets of all banks, under FAS 166/167. Of these newly consolidated assets, about 10% were held by asset-backed commercial paper (ABCP) conduits and 80% by other types of securitization entities, mostly credit card master trusts. This new VIE consolidation under FAS 166/167 effectively increased consolidating banks' regulatory capital requirements, because bank regulators decided to include the assets (and associated loan loss reserves) of all consolidated VIEs in the calculation of regulatory capital ratios (Federal Deposit Insurance Corporation (FDIC) [2009]).[2] In justifying this decision, regulators stated that the consolidation of VIEs under FAS 166/167 "will result in regulatory capital requirements that better reflect, in many cases, banking organizations' exposure to credit risk" (FDIC [2009], p. 11).

Many policy makers and academics argue that undisciplined mortgage origination by banks and other financial firms during the 2004–2006 credit

[1] FAS 166, *Accounting for Transfers of Financial Assets*, amends FAS 140, *Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities*. FAS 167, *Amendments to FASB Interpretation No. 46(R)*, amends FIN 46(R), *Consolidation of Variable Interest Entities, an Interpretation of ARB No. 51*. FAS 166 and 167 are now codified as parts of Accounting Standards Codification (ASC) Sections 860 and 810, respectively. Throughout the paper, we refer to the legacy standards, as it is simpler than referring to "the amendments of ASC Sections 860 and 810 effective in 2010."

[2] Hereafter, we refer to this as the "associated bank regulatory decision." This decision partly reflects bank regulators' passive decision to follow GAAP and partly their active elimination of the exclusion of consolidated ABCP conduits from risk-weighted assets (FDIC [2004], Acharya and Ryan [2016], subsection 4.3). To ensure that this elimination does not drive our results, we exclude bank-year observations with consolidated ABCP conduits from our sample. See subsections 2.1 and 3.1 for discussion of regulators' elimination of the ABCP exclusion and related sample selection criteria, respectively.

boom contributed significantly to the 2007–2009 financial crisis[3] (e.g., Financial Crisis Inquiry Commission [2011]). Recent regulatory reforms generally increased bank capital requirements under the view that higher capital enhances financial stability (Office of the Comptroller of the Currency [2013]). As discussed below, we provide evidence that new VIE consolidation under FAS 166/167 reduces banks' mortgage approval rates, consistent with this view.

On the other hand, the financial sector also includes the shadow banking system, which performs certain credit intermediation functions similar to those of banks but is subject to lesser or no capital requirements. The shadow banking system includes government-sponsored enterprises (GSEs) that purchase and securitize residential mortgages and bank-like financial services firms that employ securitization-based originate-to-distribute business models (Pozsar et al. [2010], Acharya [2012]).[4] Some regulators and academics criticize the recent regulatory reforms, arguing that higher capital requirements cause loan and other banking risks to migrate from banks to the less regulated shadow banking system (Kashyap, Stein, and Hanson [2010], Stein [2010], Adrian and Ashcraft [2012], Plantin [2015]).[5] Since mortgages sold by regulated banks are often purchased by institutions in the shadow banking system (Pozsar et al. [2010]), and these institutions typically securitize the mortgages, the majority of the economic risk of those sold mortgages is transferred to the shadow banking system (Rosen [2011], Han, Park, and Pennacchi [2015]). As discussed below, we provide evidence that new consolidation under FAS 166/167 increased banks' mortgage sales, supporting this concern.

We estimate that FAS 166/167 on average reduced new VIE consolidating banks' tier 1 risk-based capital ratio by about 1%.[6] In contrast, FAS 166/167 does not directly affect the capital adequacy of banks whose securitization entities remain unconsolidated or that do not engage in securitization. Variation in the impact of the standards within securitizing banks and across securitizing versus nonsecuritizing banks enables us to employ a difference-in-differences research design to test whether VIE consolidation leads banks to decrease their mortgage approval rates and increase their mortgage sale rates.

We measure the impact of FAS 166/167 as the ratio of the assets held by a bank's consolidated VIEs to the difference between the bank's total

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[3] To be precise, the credit boom ended in June 2007 and the financial crisis began in earnest a month or two later (Ryan [2008]). As we examine annual data, we refer to the financial crisis as occurring in 2007–2009.

[4] Pozsar et al. [2010] report total shadow bank liabilities of $16 trillion in 2010Q1, more than traditional bank liabilities of $13 trillion.

[5] For example, Kashyap, Stein, and Hanson [2010, p. 2] warn "the danger is that, in the face of higher capital requirements, these same forces of competition are likely to drive a greater volume of traditional banking activity into the so-called 'shadow banking' sector."

[6] In comparison, this decrease in the tier 1 capital ratio is about three times Berger et al.'s [2008, p. 137] estimate that banks on average manage that ratio upwards by 35 basis points.

assets and the assets held by its consolidated VIEs (*Consolidated_VIE_Share*). Following prior literature (e.g., Munnell et al. [1996], Loutskina and Strahan [2009], Xie [2016]), we distinguish banks' mortgage supply from mortgage demand using their decisions to approve or deny loan-level residential mortgage applications available in the Home Mortgage Disclosure Act (HMDA) database. Compared to loan growth rates, the lending measure most commonly used in prior literature, loan approval decisions are less affected by loan demand and thus better capture loan supply. We measure banks' mortgage sales as their decisions to sell the residential mortgages they originate in the year of approval, which are also available in the HMDA database.

We conduct the mortgage approval analysis on a randomly drawn stratified sample of 4,657,278 residential mortgage applications from 973 banks in 2005–2014. Thirty-three of these are "treatment" banks that consolidate at least one VIE under FAS 166/167. The aggregate total assets of the treatment banks represent 56% of banking industry assets in 2011. We find that banks that consolidate proportionately more VIE assets under FAS 166/167 experience statistically and economically significantly larger reductions in their mortgage approval rates from the 2005–2009 pre-FAS 166/167 period to the 2010–2014 post-FAS 166/167 period. To illustrate, a bank consolidating VIEs holding assets equal to 10% of its total assets (approximately one standard deviation of *Consolidated_VIE_Share*) on average experiences a 3.77% reduction in its mortgage approval rate and a 3.63% greater reduction in its mortgage approval rate than does a bank with unconsolidated VIEs holding assets equal to 10% of its total assets. The latter result suggests that it is the consolidation of securitization entities rather than securitization per se that reduces banks' mortgage supply.

We conduct the mortgage sale analysis on the approved and originated mortgages in the approval sample, consisting of 3,426,566 residential mortgages originated by the same 973 sample banks in 2005–2014. We find that banks that consolidate proportionately more VIE assets under FAS 166/167 subsequently sell a statistically and economically significantly higher proportion of the mortgages they originate from the 2005–2009 pre-FAS 166/167 period to the 2010–2014 post-FAS 166/167 period. To illustrate, a bank consolidating VIEs holding assets equal to 10% of its total assets on average experiences a 11.13% increase in its mortgage sale rate and a 13.13% greater increase in its mortgage sale rate than experienced by a bank with unconsolidated VIEs holding assets equal to 10% of its total assets. The latter result suggests that it is the consolidation of securitization entities rather than securitization per se that increases banks' mortgage sales.

Combining the results of the mortgage approval and sale analyses, we estimate that a bank consolidating VIEs holding assets equal to 10% of its total assets on average reduces its on–balance sheet mortgages by 3.15% of its total assets during the post-FAS 166/167 period, of which 0.55% (2.6%) is attributable to the bank approving fewer mortgages (selling more

mortgages into the shadow banking system). By way of comparison, for the overall sample banks from 2005 to 2014, on average the mortgage approval rate decreases by 4.1%, the mortgage sale rate increases by 15.1%, and on–balance sheet home mortgages decrease by 6.5%.

We conduct three additional sets of tests. First, to rule out financial crisis–related economic differences between VIE consolidating banks and nonconsolidating banks as an alternative explanation for our results, we conduct a falsification test during the years 2005–2009 prior to the effective date of FAS 166/167, treating the financial crisis as the event and the years 2008 and 2009 as the postevent period. We assign the amounts of each bank's initial consolidated VIE assets under FAS 166/167 to its 2008 and 2009 observations as if the bank had consolidated the VIEs in these years. We find that the assigned consolidated VIE assets are insignificantly associated with banks' mortgage approval and sale rates in 2008 and 2009. We also replicate the mortgage approval and sale analyses eliminating the precrisis years 2005 and 2006 from the sample and find that our inferences are unchanged.

Second, to strengthen our confidence in and understanding of consolidation under FAS 166/167 as the explanation for our results, we estimate expanded mortgage approval and sale models that interact banks' consolidated VIE assets with indicators for the impact of VIE consolidation on banks' regulatory capital adequacy, the strength of market discipline over banks, and loan-level mortgage risk. We find larger decreases in mortgage approval rates and larger increases in mortgage sale rates for VIE-consolidating banks that experience larger decreases in tier 1 capital ratios attributable to FAS 166/167 or are more dependent on uninsured short-term funding, as well as for riskier mortgage applications and originations.

Third, we show that our results are robust to the use of two alternative samples of banks with similar securitization activity levels, to the use of the treatment bank sample only, and to explaining the bank-year-level dollar volume of mortgages approved and sold rather than loan-level mortgage approval and sale rates.

In summary, we provide evidence that banks that newly consolidate VIEs under FAS 166/167, thereby experiencing higher capital requirements and greater market discipline, reduce their mortgage approval rates and increase their mortgage sale rates. This evidence contributes to the literature on the real effects of accounting in general and of FAS 166/167 in particular. It complements concurrent research on the impact of FAS 166/167 on banks' liquidity and equity risk (Oz [2016], Bonsall et al. [2017]), mortgage servicing (Bonsall et al. [2017]), small business lending (Dou [2017]), credit card lending (Tian and Zhang [2016]), and the sensitivity of lending to loan liquidity (Forgione and Zhao [2016]). This evidence also informs ongoing regulatory efforts to enhance financial system stability (Acharya and Ryan [2016]). The evidence suggests that consolidating banks reduce their mortgage risks, but do so in part by transferring these risks to the

less-regulated shadow banking system, very possibly an unintended consequence that could decrease the stability of the overall financial system.

2. Background Information, Related Literature, and Hypothesis Development

2.1 BACKGROUND INFORMATION

FAS 166 and FAS 167 amend FAS 140 and FIN 46(R), respectively. Under the two prior standards, securitizing banks typically accounted for securitizations as sales and did not consolidate the securitization entities, and thus they recognized only their retained interests in the securitized assets on balance sheet. For most types of securitizations, banks typically structured the securitization entities to meet the three conditions for a qualifying special purpose entity (QSPE) specified in FAS 140, thereby exempting the banks from consolidating the entities. Paragraph 35 of FAS 140 specified that QSPEs are trusts or other legal entities that are demonstrably distinct from their transferors, have significantly limited permitted activities, and are largely passive. Paragraph 46 of FAS 140 exempted QSPEs from consolidation by their transferors. Paragraph 4d of FIN 46(R) exempted QSPEs from consolidation by other parties that lack the unilateral power to liquidate the entities or to change them to not be QSPEs.

FIN 46(R) required firms to consolidate non-QSPE VIEs in which they bore more than 50% of the expected risks and rewards.[7] This entirely risk-based and quantitative approach led securitizing banks to engage in bright-line structuring to avoid consolidation of non-QSPE VIEs. For example, many banks sold first-loss interests that were just large enough to bear 50% of the entities' expected risks and rewards according to their models ("expected loss notes") to risk-tolerant investors (Bens and Monahan [2008], Acharya and Ryan [2016], subsection 4.3).

Thus, under FAS 140 and FIN 46(R), firms could bear essentially all of the risk of the assets held by QSPEs and much of the risk (particularly tail risks) of assets held by non-QSPE VIEs while not consolidating the entities. For example, sponsoring banks bore almost all the losses of their (often unconsolidated) ABCP conduits during the 2007–2009 financial crisis through the provision of liquidity and credit support (Acharya, Schnabl, and Suarez [2013]).

Both prior to and after FAS 166/167 and the associated regulatory decision, banks' total and risk-weighted assets exclude the assets of their

[7] FIN 46(R) defines VIEs as entities that either (1) have insufficient equity investment at risk to permit the entity to finance its activities without additional subordinated financial support from any parties or (2) have equity investors that do not have one or more of (i) the ability to make significant decisions relating to the entity's operations through voting or similar rights, (ii) the obligation to absorb the expected losses of the entity, and (iii) the right to receive the expected residual returns of the entity.

unconsolidated VIEs. Prior to FAS 166/167, banks' risk-weighted assets excluded the assets of ABCP conduits consolidated under FIN 46(R) (the ABCP exclusion; see FDIC [2004]). Although regulators generally required banks to hold some capital against their risk-absorbing retained interests in unconsolidated VIEs, nonconsolidation often lowered banks' capital requirements. Such "regulatory arbitrage" was a primary motivation for banks to structure securitizations to avoid consolidation of the entities (Acharya, Schnabl, and Suarez [2013], Acharya and Ryan [2016], subsection 4.3).

The 2007–2009 financial crisis revealed the sizable credit and liquidity risks that banks retained in their unconsolidated VIEs (e.g., *Financial Times* [2009]). Responding to concerns expressed by investors, bank regulators, the SEC, the President's Working Group on Financial Markets, and others that banks' financial reports did not adequately portray these risks, in June 2009 the FASB issued FAS 166 and FAS 167. FAS 166 eliminates QSPEs as a category of special purpose entities exempt from consolidation.[8] FAS 167, whose scope includes virtually all entities that previously had been deemed QSPEs, requires banks and other firms to consolidate VIEs over which they have both "the power to direct the activities . . . that most significantly impact the entity's economic performance" and the "obligation to absorb losses of the entity that could potentially be significant." This partly control-based and qualitative approach to VIE consolidation contrasts with FIN 46(R)'s entirely risk- and rewards-based and quantitative approach described above.

Figure 1 depicts our estimates of the sample banks' consolidated VIE assets and the number of sample banks that consolidate at least one VIE under FAS 166/167. These estimates are based on data hand-collected from the Form 10-K filings of publicly traded banks for 2010 and data from the FR Y-9C filings of all banks for 2011–2014. They reflect the assumption that banks did not consolidate any VIEs prior to the effective date of FAS 166/167, which yields overstated estimates to the very limited extent that banks consolidated VIEs under FAS 140 and FIN 46(R). We estimate that FAS 166's elimination of QSPEs and FAS 167's VIE consolidation approach collectively caused 27 publicly traded banks in our sample to consolidate VIEs (mostly credit card master trusts and ABCP conduits) holding $765 billion of assets at the end of 2010. The remaining 23 sample banks are private, trade over the counter, or do not disclose consolidated VIE assets in their 2010 Form 10-K filings. While not shown in figure 1, these 23 banks consolidate VIEs holding $46 billion of assets at the end of the first quarter of 2011. The total estimate of $811 billion of assets held by consolidated VIEs for the two sets of banks equals 5.6% of the total assets of all banks.

In December 2009, bank regulators issued a final rule that includes the assets held by all VIEs consolidated under FAS 166/167 (including

[8] Essentially as a consequence of its elimination of QSPEs, FAS 166 also eliminates the permission in paragraph 13 of FAS 140 of the functional equivalent of sale accounting for guaranteed mortgage securitizations involving QSPEs.

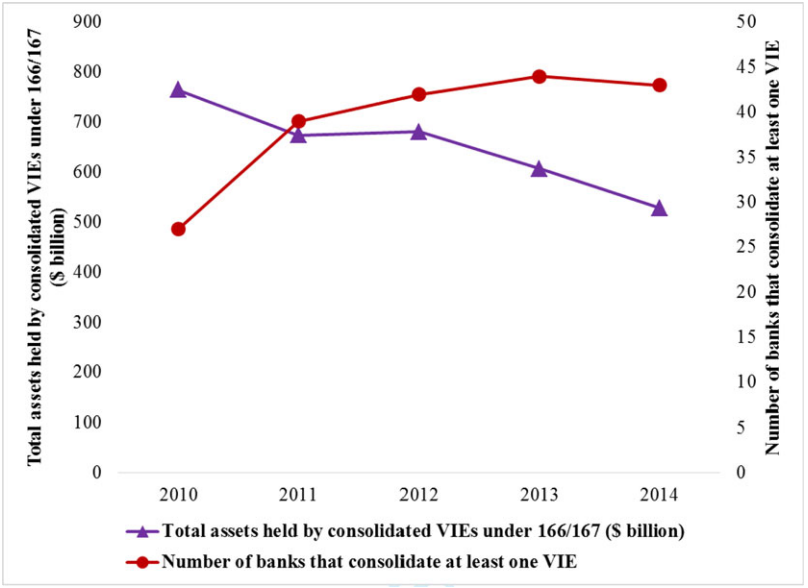

FIG. 1.—Total assets held by consolidated VIEs and number of consolidating banks under FAS 166/167. This figure shows the total assets held by consolidated VIEs (in $ billion) and the number of banks that consolidate at least one VIE under FAS 166/167. The data are collected from banks' Form 10-K filings for 2010 and FR Y-9C filings for 2011–2014.

previously excluded consolidated ABCP conduits) in banks' total assets for calculating tier 1 leverage ratios and in their risk-weighted assets for calculating risk-based capital ratios (FDIC [2009]). This rule provided banks with the option to delay the effects on their risk-based capital ratios for two quarters followed by a two-quarter phase-in.

2.2 RELATED RESEARCH

Several contemporaneous working papers provide evidence that FAS 166/167 has significant effects on banks. Two studies examine effects of FAS 166/167 on banks that differ from the effects on banks' mortgage approval and sale decisions that we examine. Oz [2016] finds that FAS 166/167 reduces two measures of securitizing banks' information asymmetry, equity bid-ask spread, and price impact of trade. Bonsall et al. [2017] find that FAS 166/167 improves the equity risk-relevance of securitizations, with only on–balance sheet securitizations being risk-relevant in the post-FAS 166/167 period. They also find that banks are more likely to sell mortgage servicing rights to third parties post-FAS 166/167.

Three studies examine effects of FAS 166/167 on banks' lending or securitization. Forgione and Zhao [2016] examine changes around the effective date of FAS 166/167 in the sensitivity of banks' on–balance sheet loan growth to Loutskina's [2011] loan portfolio liquidity index. Forgione and Zhao's [2016] focus on this sensitivity differs from our focus on banks'

mortgage approval and sale rates. In addition, they do not determine whether loan growth is attributable to loan supply, whereas we use banks' loan-level mortgage approval decisions to separate mortgage supply from mortgage demand.

Tian and Zhang [2016] investigate FAS 166/167's effects on banks' credit card receivables. Banks often securitize their credit card receivables and newly consolidate almost all of their credit card master trusts under the standards, yielding large and direct effects on these banks' regulatory capital adequacy. Tian and Zhang [2016] find that eight (all but one very large) securitizing credit card banks reduce their managed credit card receivables but improve the quality of those receivables under the standards. They conclude that FAS 166/167 *reduces* banks' ability to engage in regulatory capital arbitrage by securitizing credit card receivables.

Our setting and results differ from those of Tian and Zhang [2016] in the following respects. Although banks also frequently securitize their mortgages, they rarely consolidate mortgage securitization entities under FAS 166/167. Hence, FAS 166/167 generally does not directly affect the accounting for banks' mortgage activities. Any effect of the standards on these activities must therefore operate through changes in banks' regulatory capital adequacy and market discipline brought by the accounting changes for banks' securitized nonmortgage loans. As a consequence of these differences, we find that banks that consolidate VIEs holding more assets (including credit card receivables) under FAS 166/167 engage in *greater* regulatory capital arbitrage by selling a higher proportion of the mortgages they originate.[9]

Dou [2017] examines FAS 166/167's effect on banks' small business lending. Because small business loans are rarely securitized, even more strongly than with our study, the effect of FAS 166/167 on banks' small business loan activities must be indirect through the accounting for banks' other types of loans. Small business lending is a local banking activity that Dou [2017] exploits to develop well-matched treatment and control samples and controls for local economic conditions. Dou [2017] finds that banks that consolidate securitization entities under FAS 166/167 reduce small business lending relative to other banks that lend in the same county. He further finds that counties in which consolidating banks have higher market share subsequently exhibit reduced aggregate small business lending and lower growth in the number of small businesses. Because banks rarely sell small business loans, Dou [2017] does not examine the effects of FAS 166/167 on the volume of small business loan sales and so cannot speak to migration of loan risk into the shadow banking system, one of our two primary analyses.

[9] While it is possible that the standards lead banks to substitute mortgage lending for credit card lending, any such substitution effect should cause banks to increase their mortgage approval rates. We find, however, that banks decrease their mortgage approval rates under FAS 166/167.

While Tian and Zhang [2016], Dou [2017], and our study exhibit the differences described above, all three studies find that under FAS 166/167 banks take steps, given the types of loans examined, to increase their regulatory capital adequacy, reduce their leverage, and reduce their loan risk. These findings collectively support the notion that FAS 166/167 enhances the stability of individual banks and the regulated financial system.

2.3 HYPOTHESIS DEVELOPMENT

It is not a priori clear whether banks that consolidate previously unconsolidated VIEs under FAS 166/167 reduce their mortgage approval rates or increase their mortgage sale rates. Two non–mutually exclusive reasons exist why VIE consolidation provides incentives for banks to take these actions. First, consolidation effectively increases banks' regulatory capital requirements both by increasing banks' assets, which increases the denominator of capital ratios, and by increasing banks' loan loss reserves, which reduces the numerator of capital ratios (FDIC [2009]). Banks often maintain regulatory capital ratios around target levels above the well-capitalized threshold (Berger et al. [2008], Gropp and Heider [2010]). As VIE consolidation reduces banks' capital ratios, banks typically increase the ratios back toward their target levels by reducing lending and increasing loan sales, not by raising equity (Adrian and Shin [2011], Laux and Rauter [2017]).[10] Second, consolidation increases bank leverage, potentially increasing market pressure for banks to reduce their risk by denying high-risk mortgage applications and selling high-risk mortgages. These reasons imply that larger decreases in mortgage approval rates and increases in mortgage sale rates should occur for banks that experience larger decreases in their tier 1 capital ratios from VIE consolidation under FAS 166/167 or that are subject to higher market discipline, as well as for riskier mortgage applications and originations. We test these cross-sectional predictions in subsection 4.5.

On the other hand, two non–mutually exclusive reasons exist why VIE consolidation may not affect banks' mortgage approval and sale rates. First, consolidation of VIEs does not affect whether banks economically bear the entities' risk and rewards and so should not affect banks' ability to originate and hold mortgages. Second, banks often maintain regulatory capital well above the well-capitalized threshold, so the additional required capital for newly consolidated VIEs may not cause banks' regulatory capital requirements to bind and thus reduce their ability to originate and hold mortgages. Banking regulators stated that the banks most affected by FAS

[10] In their comment letters to bank regulators regarding their proposal to follow FAS 166/167, nearly all banking organizations indicate that the implementation of the proposal would cause banks to reduce lending (https://www.fdic.gov/regulations/laws/federal/2009/09comAD48.html). For example, the American Bankers Association [2009] warns: "Companies that securitize assets are likely to react to the increases in required regulatory capital by either decreasing lending or decreasing the amount of growth in a lending or securitization portfolio."

166/167 will continue to have capital ratios that are "substantially in excess of regulatory minimums" and thus "will not encounter an immediate or near-term need to decrease lending or raise substantial amounts of new capital for risk-based capital purposes" (FDIC [2009, p. 12]).

Overall, we expect the reasons for FAS 166/167 to decrease banks' mortgage approval rates and increase their mortgage sale rates not to be fully dominated by the reasons for the standards to have no effect on these rates. Hence, we state the following hypotheses:

H1: Banks that newly consolidate VIEs holding more assets under FAS 166/167 more strongly reduce their mortgage approval rates.

H2: Banks that newly consolidate VIEs holding more assets under FAS 166/167 more strongly increase their mortgage sale rates.

3. Sample Selection and Research Design

3.1 SAMPLE SELECTION

We employ two related main samples to test H1 and H2. To construct the mortgage approval sample, we obtain information about banks' mortgage applications and approvals for 2005–2014 from the HMDA database. We match these loan-level data to banks with the required data from the FR Y-9C filings, which yields 53,299,869 applications for 4,386 banks. We require that applications either be approved or denied, exhibit loan amount greater than $1,000 and applicant income greater than $10,000,[11] and have nonmissing information on all loan-level variables in equations (1) and (2) discussed in the next section. These criteria yield 38,993,988 applications for 4,372 banks. We further exclude observations for three banks with consolidated ABCP conduits to ensure that bank regulators' elimination of the ABCP exclusion shortly after the effective date of FAS 166/167 does not drive our results.

Due to the computing power and time required to estimate the large number of fixed effects included in our loan-level mortgage approval model, following prior literature (e.g., Dell'Ariccia, Igan, and Laeven [2012]) we extract a stratified random sample of mortgage applications. We treat each bank-year as a stratum and employ the widely used Cochran formula (Cochran [1977, pp. 75–76, 89]) to determine the sample size that yields a given level of statistical power for each stratum.[12] To ensure the data

[11] We impose this requirement because loan values smaller than $1,000 are rounded up to $1,000, and reported applicant income is censored at $10,000 (Dell'Ariccia, Igan, and Laeven [2008]).

[12] The Cochran formula is $n = \frac{t^2 PQ/d^2}{1+(\frac{t^2 PQ}{d^2}-1)/N}$, where n is the sample size, t is the t-value corresponding to a particular confidence level, P is the mortgage approval rate based on all applications received by a bank in a given year, $Q = 1-P$, d is the margin of error, and N is the number of applications received by a bank in a given year. We set t equal to 1.96 and d equal to 0.01; these values correspond to 95% confidence that the approval rate in the stratified

quality and economic significance of the observations included in the stratified sample, we require that bank-years have at least 50 applications in the stratified sample and total assets of at least $500 million in 2006 dollars.[13] These criteria yield a stratified sample of 4,657,278 mortgage applications for 5,943 bank-years and 973 banks in 2005–2014. Of the 973 sample banks, 33 consolidate at least one VIE under FAS 166/167. We refer to these banks as the "treatment" banks in the test of H1. The treatment banks' aggregate total assets equal 56% of the banking industry's total assets in 2011.

The mortgage sale sample contains the 3,426,566 originated mortgages in the mortgage approval sample. The mortgage sale sample includes the same 5,943 bank-years and 973 banks (including 33 treatment banks) in 2005–2014 as in the mortgage approval sample.

We obtain data on assets held by banks' consolidated VIEs for the 2011–2014 year ends from Schedule HC-V of their regulatory FR Y-9C filings. We hand-collect data on assets held by consolidated VIEs of publicly traded banks for the 2010 year end from their Form 10-K filings. We obtain all other bank financial data from FR Y-9C filings.

3.2 RESEARCH DESIGN

The primary empirical challenge in testing the effects of new VIE consolidation under FAS 166/167 on banks' mortgage approval and sale decisions is to distinguish these effects from those of the 2007–2009 financial crisis, which dramatically reduced securitizations of nonagency mortgages and various other types of assets, the subsequent slow economic recovery, and other economic events during the sample period. We address this challenge in our primary analysis by comparing the associations of banks' loan-level mortgage approval and sale decisions with the assets held by their consolidated VIEs versus the assets held by their unconsolidated VIEs. If we find that banks' mortgage approval (sale) rates are more negatively (positively) associated with the assets held by their consolidated VIEs than with the assets held by their unconsolidated VIEs, we would conclude that FAS 166/167 reduced banks' mortgage approval rates and increased banks' mortgage sale rates controlling for economic events.

3.2.1. Testing the Effect of FAS 166/167 on Banks' Mortgage Approval Decisions (H1). We test H1 by estimating the following linear probability model using OLS on the loan-level mortgage approval sample over the 2005–2014 period:

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random sample differs from the approval rate based on all applications received by a bank in a given year by more than 1% with less than 5% frequency.

[13] The total assets threshold for banks to be required to file quarterly FR Y-9C reports was $150 million before 2006 and $500 million beginning in 2006. We impose the intertemporally constant size threshold of $500 million in 2006 dollars (calculated using Consumer Price Index data from CRSP) to ensure that our time series results are not attributable to changing sample composition over time.

$$\begin{aligned} Approval_{i,j,t} = {} & \alpha_0 + \alpha_1 Consolidated\_VIE\_Share_{i,t} + \alpha_2 OffBS\_Securitization_{i,t} \\ & + \alpha_3 OffBS\_Securitization_{i,t} \times Post \\ & + \sum \alpha_k Bank\text{-}level\ Control\ Variable^{n}_{i,t-1} \\ & + \sum \alpha_l Loan\text{-}level\ Control\ Variable^{m}_{j,t-1} \\ & + Bank\ Fixed\ Effects + \ Year \times MSA\ Fixed\ Effects \\ & + Year \times Loan\text{-}characteristics\ Fixed\ Effects + \varepsilon_{i,j,t}. \end{aligned} \tag{1}$$

The dependent variable, $Approval_{i,j,t}$, equals 1 if bank i approves borrower j's application in year t and 0 if the bank denies the application. The main independent variable of interest, $Consolidated\_VIE\_Share_{i,t}$, equals the assets held by bank i's consolidated VIEs in year t divided by the difference between bank i's total assets and the assets held by its consolidated VIEs in that year during the 2010–2014 post-FAS 166/167 period, and it equals 0 during the 2005–2009 pre-FAS 166/167 period.[14] The coefficient α_1 on $Consolidated\_VIE\_Share_{i,t}$ captures the effect of the assets held by banks' consolidated VIEs under FAS 166/167 on their mortgage approval rates. A negative α_1 indicates that banks that consolidate more VIE assets relative to their total assets exhibit lower mortgage approval rates, consistent with H1.

$OffBS\_Securitization_{i,t}$ equals the outstanding principal balance of off–balance sheet assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements, divided by the difference between the bank's total assets and the assets held by its consolidated VIEs in year t. *Post* is an indicator variable equal to 1 for the post-FAS 166/167 period and 0 for the pre-FAS 166/167 period. The sum of the coefficients α_2 on $OffBS\_Securitization_{i,t}$ and α_3 on $OffBS\_Securitization_{i,t} \times Post$ captures the effect of banks' off–balance sheet securitizations under FAS 166/167 on their mortgage approval rates. The expression $\alpha_1 - (\alpha_2 + \alpha_3)$ captures the difference of the effects on mortgage approval rates of the assets held by banks' consolidated VIEs versus unconsolidated VIEs under FAS 166/167. A negative value for this expression indicates that banks' mortgage approval rates are more negatively associated with the assets held by their consolidated VIEs than with the assets held by their unconsolidated VIEs under FAS 166/167, consistent with H1.

Equation (1) includes four bank-level control variables to capture heterogeneity in banks' business models: (1) the sum of available-for-sale and held-to-maturity securities divided by total assets (*Securities_Share*); (2) interest and fee income on loans divided by the sum of interest and fee income on loans and total noninterest income (*Loan_Income_Share*); (3) core deposits divided by total assets (*Core_Deposit_Share*) following Ivashina and Scharfstein [2010] and Cornett et al. [2011]; and (4) annual growth in

[14] To ensure that the denominator of *Consolidated_VIE_Share* does not drive any of our results, we reestimated equation (1) and also equation (2) replacing *Consolidated_VIE_Share* with its denominator. We find an insignificant coefficient on the denominator, suggesting that it does not drive any of our results.

wholesale funding divided by total assets (*WSF_Growth*) following Hahm, Shin, and Shin [2013].

Equation (1) also includes five other bank-level control variables often included in models used in empirical bank accounting research: (1) nonperforming loans divided by total loans (*NPL*); (2) the average deposit interest rate (*Deposit_Rate*); (3) the sum of goodwill impairment, other-than-temporary impairments on investment securities, and excess loan loss provisions, divided by average total assets (*Writedowns*); (4) income before writedowns divided by average total assets (*ROA_ex_Writedowns*); (5) tier 1 risk-based capital ratios (*Tier1_Capital_Ratio*); and (6) the natural logarithm of total assets in 2006 dollars (in $ thousands) (*Bank_Size*). The equation also includes an indicator variable for whether the bank is subject to these tests (*Stress_Test*). All bank-level control variables are lagged by one year to ensure that banks' mortgage activities during the year do not affect the control variables.

Equation (1) includes the following loan-level variables to control for the quality and composition of mortgage applications, which directly affect banks' mortgage approval decisions: (1) the natural logarithm of the applicant's income (*Applicant_Income*); (2) the loan amount divided by borrower income (*Loan_to_Income*) following Loutskina and Strahan [2009]; (3) the natural logarithm of the mortgage amount (in $ thousands) (*Log_Mortgage_Amount*); (4) a dummy variable indicating whether the loan is a high-rate or high-fee loan covered by the (amended) Home Ownership and Equity Protection Act (*High_Cost*); (5) a dummy variable indicating whether the loan is not secured by a lien (*Not_Secured*); and (6) borrower gender.

To control for time-invariant heterogeneity across banks and local demand for credit, equation (1) includes bank fixed effects and interactive year × metropolitan statistical area (MSA) fixed effects, respectively.[15] Finally, to further control for the heterogeneity of mortgage applications, we include fixed effects for the interactions between year and the following loan characteristics: (1) whether the mortgage is eligible to be sold to GSEs such as Fannie Mae (*Conforming_Loan*); (2) ethnicity, for example, Hispanic versus non-Hispanic (*Ethnicity*); (3) race, for example, white versus African American (*Race*); (4) loan type, for example, conventional versus Federal Housing Administration–insured mortgages (*Loan_Type*); (5) loan purpose, for example, home purchase versus refinancing (*Loan_Purpose*); (6) property type, for example, one- to four-family housing versus multifamily housing (*Property_Type*); and (7) whether the property is owner-occupied or not (*Owner_Occupied*).

Following prior literature (e.g., Puri, Rocholl, and Steffen [2011], Dell'Ariccia, Igan, and Laeven [2012]), we estimate equation (1) using

[15] An MSA is an area containing a sizeable population core (currently 50,000 people) and adjacent communities that exhibit a high degree of integration with that core. Our sample contains 435 MSAs.

OLS rather than a nonlinear approach (probit or logit). This is because the equation includes a large number of bank fixed effects to estimate in our rather narrow panel ($T = 10$), yielding the incidental parameter problem with nonlinear estimation. This problem yields inconsistent and biased estimates of fixed effects and coefficients.[16]

3.2.2. Testing the Effect of FAS 166/167 on Banks' Mortgage Sale Decisions (H2). We test H2 by estimating the following linear probability model using OLS on the mortgage sale sample over the 2005–2014 period:

$$\begin{aligned} Sold_{i,j,t} = {} & \alpha_0 + \alpha_1 Consolidated\_VIE\_Share_{i,t} + \alpha_2 OffBS\_Securitization_{i,t} \\ & + \alpha_3 OffBS\_Securitization_{i,t} \times Post \\ & + \sum \alpha_k Bank\text{-}level\ ControlVariable^{n}_{i,t-1} \\ & + \sum \alpha_l Loan\text{-}level\ Control\ Variable^{m}_{j,t-1} \\ & + Bank\ Fixed\ Effects + Year \times MSA\ Fixed\ Effects \\ & + Year \times Loan\text{-}characteristics\ Fixed\ Effects + \varepsilon_{i,j,t}. \end{aligned} \tag{2}$$

The dependent variable, $Sold_{i,j,t}$, equals 1 if bank i sells the mortgage approved to borrower j in year t to an unaffiliated party in that year, and 0 otherwise.[17] The coefficient α_1 on $Consolidated\_VIE\_Share_{i,t}$ captures the effect of the assets held by banks' consolidated VIEs under FAS 166/167 on mortgage sales. A positive α_1 indicates that banks' consolidation of VIEs holding more assets relative to banks' total assets is associated with higher mortgage sale rates, consistent with H2. Similar to equation (1), the expression $\alpha_1 - (\alpha_2 + \alpha_3)$ captures the difference of the effects on banks' mortgage sale rates of the assets held by their consolidated VIEs versus their unconsolidated VIEs. A positive value for this expression would indicate that banks' mortgage sale rates are more positively associated with the assets held by their consolidated VIEs than with the assets held by their unconsolidated VIEs under FAS 166/167, consistent with H2. Equation (2) includes all bank- and loan-level control variables and fixed effects included in equation (1).

All continuous variables in equations (1) and (2) are winsorized at the 1% and 99% levels each year, except that only the positive values

[16] Neyman and Scott [1948] first identified the incidental parameter problem, which refers to inconsistent coefficient estimation in nonlinear models with fixed effects (i.e., the incidental parameters) when the number of observations for each individual (T) is fixed and the number of individuals (N) increases to infinity (Lancaster [2000], Wooldridge [2002, pp. 483–484], Greene [2004]). The estimates of the fixed effects and the coefficients on the other model variables are inconsistent. Of most concern for our paper, these estimates are biased when T is small (Greene [2004]).

[17] The HMDA database indicates whether originated mortgages are retained or sold in the calendar year of approval to various types of purchasers, including GSEs (e.g., Fannie Mae and Freddie Mac), private securitizers, unaffiliated institutions (e.g., unaffiliated commercial banks), and affiliated institutions. We treat mortgages sold to affiliated institutions as not sold. If a bank retains a majority interest in a sold mortgage, then under HMDA guidance (A Guide to HMDA Reporting 2012, p. 16), the bank does not report that mortgage as sold in the HMDA database.

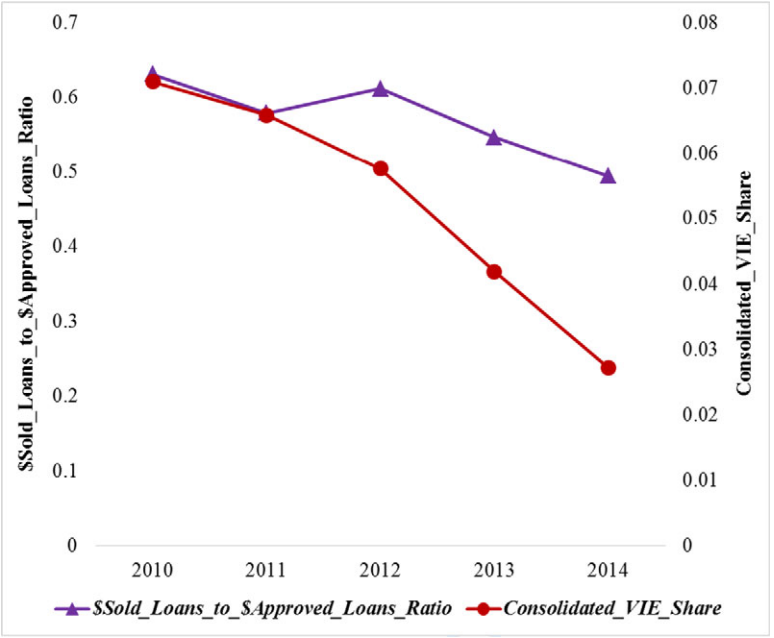

FIG. 2.—Proportion of approved mortgages sold and share of bank assets in consolidated VIEs. This figure shows the proportion (based on dollar amounts) of approved mortgages sold (*$Sold_Loans_to_$Approved_Loans_Ratio*) and the average ratio of assets held by a bank's consolidated VIEs to the difference between the bank's total assets and the assets held by its consolidated VIEs (*Consolidated_VIE_Share*) over 2010–2014.

of *Consolidated_VIE_Share* and *OffBS_Securitization* are winsorized at the 1% and 99% levels for the entire 2005–2014 sample period. Given that only 111 (479) bank-year observations have positive values of *Consolidated_VIE_Share* (*OffBS_Securitization*), the latter winsorization method preserves cross-sectional variation in these variables. Figure 2 depicts a monotonic decline in the proportion of approved mortgages in dollar amounts that are subsequently sold (*$Sold_Loans_to_$Approved_Loans_Ratio*) and the annual average ratio of assets held by a bank's consolidated VIEs to the difference between the bank's total assets and the assets held by its consolidated VIEs (*Consolidated_VIE_Share*) over 2010–2014. This decline is consistent with banks reducing the size of their consolidated VIEs to reduce the impact of FAS 166/167, resulting in fewer mortgage sales. The comovement between these two variables is consistent with H2.

4. Results

4.1 DESCRIPTIVE ANALYSIS

4.1.1. Types of Loans Held by Banks' Newly Consolidated VIEs Under FAS 166/167. Banks' FR Y-9C filings do not contain data on the types of loans

(e.g., credit card receivables) held by their consolidated VIEs. However, Schedule HC-S of these filings reports the outstanding principal balances of various types of assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements (i.e., off–balance sheet securitized loans). As described below, we use these data to estimate the amount of each loan type held by each bank's newly consolidated VIEs under FAS 166/167. We include all banks that consolidate at least one VIE in 2011 in this analysis.[18]

This bank-level estimation approach exploits the fact that, aside from governmental and conforming mortgages, there was very little new issuance of asset-backed securities during 2009–2010 (SIFMA [2016]). Hence, the reduction in the outstanding principal balance of off–balance sheet securitized loans during 2009 should primarily reflect the amortization of previously securitized loans, while the reduction in the outstanding principal balance of off–balance sheet securitized loans during 2010 should reflect both the amortization of previously securitized loans and the assets held by banks' newly consolidated VIEs under FAS 166/167. We thus estimate the assets held by banks' newly consolidated VIEs under FAS 166/167 as the difference between the reductions in the outstanding balance of off–balance sheet securitized loans during 2010 versus 2009. Appendix B reports these bank-level estimations. The main limitation of this approach is that banks may liquidate or dispose of all their interests in some VIEs during 2009 or 2010, although this appears to have been rare outside of ABCP conduits.

Using this approach, we estimate that FAS 166/167 caused banks to consolidate VIEs holding essentially all of their securitized credit card receivables, almost all of their securitized auto loans, some of their securitized home equity lines of credit, most of their securitized other consumer loans (excluding one to four family residential mortgages), and some of their securitized commercial and industrial loans that had previously been held by unconsolidated VIEs. Credit card receivables constitute the vast majority of the dollar amount of consolidated VIE assets, $361 billion, followed by $20 billion for other consumer loans (excluding one to four family residential loans), $15 billion for auto loans, $11 billion for home equity lines of credit, and $10 billion for commercial and industrial loans.[19]

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[18] We base this sample selection on banks' consolidation of VIEs in 2011, the first year that information about consolidated VIEs is available for all banks that file FR Y-9C filings. Information on consolidated VIEs in 2010 is not available in Form 10-K filings for banks that are either private, or trade over the counter, or do not disclose the amount of assets held by their consolidated VIEs in these filings.

[19] Interestingly, FAS 166/167 caused very little consolidation of VIEs holding 1-4 family residential mortgages by banks, despite the fact that securitization of subprime and other types of credit-risky mortgages played significant roles in the genesis of the 2007–2009 financial crisis and in gaining general acceptance for the passage of FAS 166/167. This lack of consolidation occurred because GSEs and servicers are most commonly deemed the parties to consolidate the entities in securitizations of agency and nonagency residential mortgages, respectively, under FAS 166/167 (Deloitte [2014]). Bonsall et al. [2017] find that, after SFAS 166/167,

4.1.2. Descriptive Statistics. Of the banks that consolidate at least one VIE under FAS 166/167 in 2011, Bank of America, Citigroup, and JPMorgan Chase consolidate the highest dollar amounts of VIE assets at $157 billion, $142 billion, and $102 billion, respectively. Discover Financial Services, CIT Group, and Ally Financial consolidate the highest amount of VIE assets as a percentage of their total assets at 121%, 44%, and 36%, respectively.

Of the 4,657,278 loan-level observations in the mortgage approval sample, 2,326,137 (49.9%) are in the post-FAS 166/167 period and 403,263 (8.7%) are for the 33 treatment banks (111 bank-year observations) that consolidate at least one VIE. Panel A of table 1 reports descriptive statistics of the variables in the mortgage approval analysis. The mean mortgage approval rate is 80%. The mean impact of VIE consolidation on banks' tier 1 risk-based capital ratios is a one percentage point decrease in the ratios. We calculate the impact of VIE consolidation on a bank's tier 1 risk-based capital ratio "as if" consolidated VIEs were not consolidated minus the reported tier 1 risk-based capital ratio (*Impact_On_Tier1_Capital_Ratio*). The "as if" ratio incorporates the increases in both risk-weighted assets and loan loss reserves from VIE consolidation. See the definition of *Impact_On_Tier1_Capital_Ratio* in appendix A for further details about its calculation. The mean applicant income is $74,440. The mean loan-to-income ratio is 1.83.

Of the 3,426,566 loan-level observations in the mortgage sale sample, 1,729,256 (50.5%) are in the post-FAS 166/167 period, and 251,676 (7.3%) are for the 33 treatment banks (111 bank-year observations) that consolidate at least one VIE. Panel B of table 1 reports descriptive statistics of the variables in the mortgage sale analysis. The mean mortgage sale rate is 50%. We also compute the correlation matrices for the mortgage approval and sale samples, respectively. The explanatory variables exhibit relatively low correlations (untabulated).

4.2 THE EFFECT OF FAS 166/167 ON BANKS' MORTGAGE APPROVAL DECISIONS (H1)

Column 1 of table 2 reports the estimation of equation (1) regarding the effect of VIE consolidation under FAS 166/167 on banks' loan-level mortgage approval decisions using the full mortgage approval sample. The coefficient on the main variable of interest, *Consolidated_VIE_Share*, is significantly negative (–0.377, $p < 0.001$),[20] consistent with consolidation of VIEs under the standards reducing banks' mortgage approval rates. In terms of economic significance, this coefficient implies that a 10% (approximately one standard deviation) increase in *Consolidated_VIE_Share* yields a sizeable

sponsoring banks typically no longer retain the role as servicer, avoiding consolidating nonagency residential mortgage securitizations.

[20] For simplicity, throughout the paper we report significance levels in two-tailed tests, even when the hypotheses are one-tailed.

TABLE 1

Descriptive Statistics for the Mortgage Approval and Mortgage Sale Samples

Panel A: Descriptive statistics for the mortgage approval sample

Variable	*N*	Mean	SD	p10	p25	Median	p75	p90
Dependent variable:								
Approval	4,657,278	0.80	0.40	0	1	1	1	1
Main independent variable (nonzero *Consolidated_VIE_Share* observations):								
Consolidated_VIE_Share	403,263	0.06	0.10	0.001	0.004	0.01	0.04	0.17
Impact of VIE consolidation on Tier 1 Capital Ratio (nonzero *Consolidated_VIE_Share* observations):								
Impact_On_Tier1_Capital_Ratio	403,263	0.01	0.01	0.0001	0.0003	0.001	0.004	0.019
Loan-level control variables:								
Log_Applicant_Income	4,657,278	4.31	0.74	3.40	3.81	4.28	4.74	5.24
Loan_to_Income	4,657,278	1.83	1.36	0.25	0.70	1.64	2.66	3.68
Log_Mortgage_Amount	4,657,278	4.52	1.17	2.77	3.93	4.74	5.30	5.80
High_Cost	4,657,278	0.001	0.03	0	0	0	0	0
Not_Secured	4,657,278	0.07	0.25	0	0	0	0	0
Bank-year-level control variables:								
OffBS_Securitization	4,657,278	0.04	0.15	0	0	0	0	0.13
Post	4,657,278	0.50	0.5	0	0	0	1	1
Stress_Test	4,657,278	0.09	0.28	0	0	0	0	0
Securities_Share	4,657,278	0.20	0.11	0.08	0.13	0.18	0.25	0.34
Loan_Income_Share	4,657,278	0.62	0.14	0.43	0.54	0.64	0.72	0.78
NPL	4,657,278	0.02	0.02	0.00	0.01	0.01	0.03	0.05
Core_Deposit_Share	4,657,278	0.62	0.13	0.46	0.56	0.65	0.71	0.76
Deposit_Rate	4,657,278	0.02	0.01	0.00	0.01	0.02	0.03	0.04
WSF_Growth	4,657,278	0.01	0.06	–0.05	–0.02	0.00	0.04	0.08
Writedowns	4,657,278	0.003	0.01	0.00	0.00	0.00	0.00	0.01
ROA_ex_Writedowns	4,657,278	0.01	0.01	0.00	0.01	0.01	0.01	0.02
Tier1_Capital_Ratio	4,657,278	0.12	0.04	0.08	0.10	0.12	0.14	0.16
Bank_Size	4,657,278	15.58	1.82	13.43	14.00	15.23	16.83	18.54

Panel B: Descriptive statistics for the mortgage sale sample

Variable	*N*	Mean	SD	p10	p25	Median	p75	p90
Dependent variable:								
Sold	3,426,566	0.50	0.50	0	0	0	1	1
Main independent variable (nonzero *Consolidated_VIE_Share* observations):								
Consolidated_VIE_Share	251,676	0.05	0.10	0.00	0.00	0.01	0.04	0.17
Impact of VIE consolidation on Tier 1 Capital Ratio (nonzero *Consolidated_VIE_Share observations*):								
Impact_On_Tier1_Capital_Ratio	251,676	0.01	0.01	0.0001	0.0003	0.001	0.004	0.02
Loan-level control variables:								
Log_Applicant_Income	3,426,566	4.37	0.72	3.50	3.87	4.33	4.80	5.30
Loan_to_Income	3,426,566	1.84	1.29	0.29	0.78	1.67	2.63	3.58
Log_Mortgage_Amount	3,426,566	4.62	1.09	3.14	4.11	4.81	5.34	5.82
High_Cost	3,426,566	0.001	0.04	0	0	0	0	0
Not_Secured	3,426,566	0.05	0.21	0	0	0	0	0
Bank-year-level control variables:								
OffBS_Securitization	3,426,566	0.03	0.12	0	0	0	0	0.06
Post	3,426,566	0.50	0.50	0	0	1	1	1

(Continued)

TABLE 1—*Continued*

Variable	*N*	Mean	SD	p10	p25	Median	p75	p90
Stress_Test	3,426,566	0.07	0.26	0	0	0	0	0
Securities_Share	3,426,566	0.20	0.11	0.08	0.13	0.18	0.25	0.35
Loan_Income_Share	3,426,566	0.63	0.14	0.44	0.55	0.64	0.72	0.78
NPL	3,426,566	0.02	0.02	0.00	0.01	0.01	0.03	0.05
Core_Deposit_Share	3,426,566	0.62	0.13	0.47	0.57	0.65	0.71	0.76
Deposit_Rate	3,426,566	0.02	0.01	0.00	0.01	0.02	0.03	0.04
WSF_Growth	3,426,566	0.01	0.06	–0.05	–0.02	0.00	0.04	0.08
Writedowns	3,426,566	0.003	0.01	0.00	0.00	0.00	0.00	0.01
ROA_ex_Writedowns	3,426,566	0.01	0.01	0.00	0.01	0.01	0.01	0.02
Tier1_Capital_Ratio	3,426,566	0.12	0.04	0.09	0.10	0.12	0.14	0.16
Bank_Size	3,426,566	15.37	1.75	13.39	13.87	14.95	16.49	18.17

This table reports descriptive statistics of the variables for the mortgage approval and mortgage sale samples. Panel A reports descriptive statistics for the mortgage approval sample, a stratified random sample of 4,657,278 mortgage applications for 5,943 bank-year observations from 973 banks during 2005–2014. Panel B reports descriptive statistics for the mortgage sale sample, all 3,426,566 originated mortgages in the mortgage approval sample, again for 5,943 bank-year observations from 973 banks during 2005–2014. The descriptive statistics for *Consolidated_VIE_Share* and *Impact_On_Tier1_Capital_Ratio* are for the subsets of the samples with nonzero *Consolidated_VIE_Share*. All variables are defined in appendix A.

3.77% reduction in the average mortgage approval rate. Ignoring mortgage amortization, prepayment, and sale, this reduction translates into a decrease in mortgages equal to 1.1% of the total assets for the average treatment bank.[21]

Importantly, the difference between the coefficient on *Consolidated_VIE_Share* and the sum of the coefficients on *OffBS_Securitization* and *OffBS_Securitization* × *Post* is also negative with similar magnitude, statistical significance (–0.363, $p < 0.001$), and economic significance. Compared to a bank with unconsolidated VIEs holding assets equal to 10% of its total assets, a bank consolidating VIEs holding assets equal to 10% of its total assets on average experiences a 3.63% greater decrease in the mortgage approval rate. This result indicates that banks' mortgage approval rates are significantly more negatively affected by the assets held by their consolidated VIEs than by their off–balance sheet securitized assets, suggesting that it is banks' consolidation of securitization entities, rather than securitization per se, that reduces banks' mortgage supply.

The insignificant coefficient on *Stress_Test* suggests that supervisory stress tests do not affect banks' mortgage approval decisions. Consistent with less risky borrowers' applications being more likely to be approved, mortgage approval rates are significantly positively associated with applicants' income (*Log_Applicant_Income*) and significantly negatively associated with their loan-to-income ratio (*Loan_to_Income*). High-rate or high-fee (*High_Cost*)

[21] For the average treatment bank-year, we estimate that the total dollar amount of mortgage applications reported in the HMDA database equals 5.8% of the bank's total assets. Thus, ignoring mortgage amortization, prepayment, and sale, a 3.77% reduction in the average mortgage approval rate implies a cumulative decrease in mortgages equal to 1.1% (= 3.77% × 5 × 5.8%) of the bank's total assets over the five-year 2010–2014 post-FAS 166/167 period.

TABLE 2
The Effect of VIE Consolidation Under FAS 166/167 on Banks' Mortgage Approval and Sale Decisions

	Dependent Variable = *Approval* (1)	Dependent Variable = *Sold* (2)
Consolidated_VIE_Share	−0.377***	1.113***
	(<0.001)	(0.008)
OffBS_Securitization	0.025	0.086
	(0.465)	(0.409)
OffBS_Securitization × Post	−0.039	−0.286*
	(0.164)	(0.055)
Stress_Test	−0.003	0.001
	(0.776)	(0.965)
Securities_Share	−0.062	−0.156*
	(0.184)	(0.064)
Loan_Income_Share	−0.099**	−0.068
	(0.021)	(0.256)
NPL	0.060	−0.330
	(0.709)	(0.392)
Core_Deposit_Share	−0.103*	−0.009
	(0.058)	(0.922)
Deposit_Rate	−0.004	−0.338
	(0.994)	(0.718)
WSF_Growth	0.053	−0.215***
	(0.182)	(0.006)
Writedowns	0.683**	0.098
	(0.014)	(0.854)
ROA_ex_Writedowns	−0.892**	0.050
	(0.030)	(0.930)
Tier1_Capital_Ratio	−0.178*	−0.049
	(0.072)	(0.795)
Bank_Size	−0.010	0.014
	(0.355)	(0.484)
Log_Applicant_Income	0.047***	−0.072***
	(<0.001)	(<0.001)
Loan_to_Income	−0.033***	−0.017***
	(<0.001)	(<0.001)
Log_Mortgage_Amount	0.025***	0.125***
	(<0.001)	(<0.001)
High_Cost	0.285***	−0.162***
	(<0.001)	(<0.001)
Not_Secured	−0.117***	−0.057***
	(<0.001)	(0.009)

(Continued)

mortgage applications are more likely to be approved. Applications for mortgages not secured by a lien (*Not_Secured*) are less likely to be approved.

4.3 THE EFFECT OF FAS 166/167 ON BANKS' MORTGAGE SALE DECISIONS (H2)

Column 2 of table 2 reports the estimation of equation (2) regarding the effect of VIE consolidation under FAS 166/167 on banks' loan-level

TABLE 2—*Continued*

	Dependent Variable = *Approval* (1)	Dependent Variable = *Sold* (2)
Observations	4,657,278	3,426,566
Adjusted-R^2	0.15	0.49
OffBS_Securitization + *OffBS_Securitization* × *Post*	−0.014 (0.483)	−0.200 (0.282)
Difference:		
Consolidated_VIE_Share − (*OffBS_Securitization* + *OffBS_Securitization* × *Post*)	−0.363*** (<0.001)	1.313** (0.010)

Column 1 of the table reports the estimation of equation (1), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage approval decisions, using the mortgage approval sample of 4,657,278 mortgage applications for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Approval*, equals 1 (0) if an application is approved (denied). Column 2 of the table reports the estimation of equation (2), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage sale decisions, using the mortgage sale sample of 3,426,566 originated mortgages for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Sold*, equals 1 if an originated mortgage is sold to an unaffiliated party in the calendar year of approval and 0 if it is not sold. All other variables are defined in appendix A. The models include bank fixed effects, year × MSA fixed effects, and fixed effects for year × each of *Conforming_Loan*, *Race*, *Ethnicity*, *Loan_Purpose*, *Loan_Type*, *Property_type*, and *Owner_Occupancy*. Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by bank. *p*-values are reported in parentheses below coefficient estimates and are indicated as follows: $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

mortgage sale decisions using the full mortgage sale sample. The coefficient on the main variable of interest, *Consolidated_VIE_Share*, is significantly positive (1.113, $p = 0.008$), consistent with the consolidation of VIEs under FAS 166/167 increasing banks' mortgage sale rates. In terms of economic significance, this coefficient implies that a 10% increase in *Consolidated_VIE_Share* yields a sizeable 11.13% increase in the average mortgage sale rate, which translates into a decrease in mortgage loans after sale equivalent to 2.6% of bank total assets for the average treatment bank.[22]

Importantly, the difference between the coefficient on *Consolidated_VIE_Share* and the sum of the coefficients on *OffBS_Securitization* and *OffBS_Securitization* × *Post* is also positive and statistically significant (1.313, $p = 0.010$) and economically significant. Compared to a bank with unconsolidated VIEs holding assets equal to 10% of its total assets, a bank consolidating VIEs holding assets equal to 10% of its total assets on average experiences a 13.13% greater increase in its mortgage sale rate. This result is consistent with banks' mortgage sale rates being significantly more positively affected by the assets held by their consolidated VIEs than by the assets held by their unconsolidated VIEs, suggesting that it is the consolidation of securitization entities, rather than securitization per se, that increases banks' mortgage sales.

[22] For the average treatment bank-year, we estimate that the total dollar amount of originated mortgages reported in the HMDA database equals 4.7% of bank total assets. Thus, ignoring mortgage amortization and prepayment, a 11.13% increase in the average mortgage sale rate implies a cumulative decrease in mortgages equal to 2.6% (= 11.13% × 5 × 4.7%) of the bank's total assets over the five-year 2010–2014 post-FAS 166/167 period.

As for the control variables, two proxies for bank liquidity, percentage holdings of securities (*Securities_Share*) and growth in wholesale funding (*WSF_Growth*), are significantly negatively associated with the mortgage sale rate. Consistent with riskier mortgages being more likely to be sold, applicants' income (*Log_Applicant_Income*) is significantly negatively associated with the mortgage sale rate. However, the loan-to-income ratio (*Loan_to_Income*) and absence of a lien on the property (*Not_Secured*) are significantly negatively associated with the mortgage sale rate.

The discussion in subsection 4.2 and this section indicates that VIE consolidation both decreases banks' mortgage approval rates and increases their mortgage sale rates. To illustrate the collective economic significance of these two effects, assume that the decrease in the mortgage approval rate proportionately reduces originated mortgages that are retained versus sold. Under this assumption, and incorporating the statistic that the sample banks sell 50% of their originated mortgages reported in table 1, panel B, we estimate that consolidating VIE assets equal to 10% of total assets during the 2010–2014 post-FAS 166/167 period decreases banks' on–balance sheet mortgages by 3.15% of their total assets[23] and increases the mortgages banks sell into the shadow banking system by 2.05% of their total assets.[24]

4.4 RULING OUT THE FINANCIAL CRISIS AS AN ALTERNATIVE EXPLANATION

The most likely alternative explanation for our findings is that the 2007–2009 financial crisis affected VIE-consolidating banks more adversely than nonconsolidating banks. Our primary analyses comparing the coefficients on on–balance sheet securitized assets versus off–balance sheet securitized assets (including the off–balance sheet securitized assets of VIE-consolidating banks) substantially mitigate this concern. To further rule out this alternative explanation, we conduct two sets of tests as follows.

4.4.1. Falsification Tests. We estimate equations (1) and (2) on the mortgage approval and sale samples, during the 2005–2009 pre-FAS 166/167 period, treating the financial crisis as the event and the years 2008 and 2009 as the postevent period. For each consolidating bank, we assign the value of *Consolidated_VIE_Share* in 2010 for the public banks in the sample (from their hand-collected Form 10-K filings) and in 2011 for the remaining sample banks (from their FR Y-9C filings) to the 2008 and 2009 values of this

[23] This 3.15% estimate equals 0.55%, that is, the 1.1% reduction of the mortgage origination rate estimated in footnote 21 times the 50% mortgage sale rate, plus the 2.6% increase in the mortgage sales rate estimated in footnote 22. Given that the treatment banks hold aggregate total assets of $7.5 trillion, the 3.15% estimate implies that treatment banks reduced their holdings of mortgages by $236 billion.

[24] This 2.05% estimate equals the 2.6% increase in the mortgage sales rate estimated in footnote 22 minus the 1.1% reduction of the mortgage origination rate estimated in footnote 21 times the 50% mortgage sale rate. Given that the treatment banks hold aggregate total assets of $7.5 trillion, the 2.05% estimate implies that treatment banks increased their sales of mortgages into the shadow banking system by $154 billion.

variable. If our primary results are attributable to the differential effects of the crisis, then the coefficients on (the assigned) *Consolidated_VIE_Share* should be significantly negative and positive in the estimations of equations (1) and (2), respectively. The results, reported in online appendix, do not support this prediction.

4.4.2. Eliminating the Precrisis Years. We replicate the analyses in table 2 during the 2007–2014 sample years, that is, eliminating the 2005 and 2006 precrisis years. The results, reported in the online appendix, yield the same inferences as those reported in table 2. Overall, the two sets of tests support the conclusion that our primary findings are not attributable to the financial crisis differentially affecting VIE-consolidating and nonconsolidating banks.

4.5 POTENTIAL MECHANISMS

In this section, we evaluate potential mechanisms through which new VIE consolidation under FAS 166/167 may affect banks' mortgage approval and sale decisions. Ryan [2017] argues that the reduction of banks' regulatory capital adequacy resulting from VIE consolidation likely is the primary mechanism due to the size of the impact on capital for consolidating banks and the considerable public information available in financial and regulatory reports about off–balance sheet securitizations, which reduces the strength of the other explanations. Evidence in Bonsall et al. [2017], however, suggests that new consolidation increases market discipline by reducing consolidating banks' perceived creditworthiness. Finally, because of regulatory capital adequacy and market discipline considerations, banks may prefer not to recognize high-risk mortgages on balance sheet. To evaluate these mechanisms, we estimate expansions of equations (1) and (2) that interact *Consolidated_VIE_Share* with indicators for bank-years for which these mechanisms are more versus less likely to operate. As discussed below, we find evidence that all three mechanisms are in operation.

4.5.1. The Impact of VIE Consolidation on Banks' Regulatory Capital Adequacy. If the impact of VIE consolidation under FAS 166/167 on banks' regulatory capital adequacy is the mechanism, we expect H1 and H2 to hold more strongly for banks whose regulatory capital ratios are reduced more by consolidation. To test for this mechanism, we conduct the mortgage approval and sale analyses distinguishing the treatment bank-year observations based on impacts on their tier 1 risk-based capital ratio (*Impact_On_Tier1_Capital_Ratio*). The indicator variable *High_Capital_Ratio_Impact* takes a value of 1 (0) for above-median (below-median) impact for a bank in a year.

Columns 1 and 2 of table 3 report the estimations of the expanded mortgage approval and sale equations for the full loan-level mortgage approval and sale samples, respectively, in 2005–2014. For the mortgage approval analysis in column 1, the coefficient on *Consolidated_VIE_Share* is

TABLE 3
Partitioning on the Impact of VIE Consolidation on the Tier 1 Capital Ratio

	Dependent Variable = *Approval* 2005–2014 (1)	Dependent Variable = *Sold* 2005–2014 (2)
Consolidated_VIE_Share	−0.209***	0.803***
	(<0.001)	(<0.001)
Consolidated_VIE_Share × *High_Capital_Ratio_Impact*	−0.493***	0.814
	(<0.001)	(0.140)
OffBS_Securitization	0.028	0.091
	(0.389)	(0.379)
OffBS_Securitization × *Post*	−0.055**	−0.277*
	(0.047)	(0.056)
Controls	Yes	Yes
Observations	4,657,278	3,426,566
Adjusted-R^2	0.15	0.49
Consolidated_VIE_Share + *Consolidated_VIE_Share* × *High_Capital_Ratio_Impact*	−0.703***	1.617**
	(<0.001)	(0.022)
OffBS_Securitization + *OffBS_Securitization* × *Post*	−0.028	−0.186
	(0.228)	(0.290)
Difference:		
Consolidated_VIE_Share − *(OffBS_Securitization* + *OffBS_Securitization* × *Post)*	−0.182***	0.988***
	(0.006)	(0.001)
Consolidated_VIE_Share + *Consolidated_VIE_Share* × *High_Capital_Ratio_Impact* − *(OffBS_Securitization* + *OffBS_Securitization* × *Post)*	−0.675***	1.802**
	(<0.001)	(0.019)

This table reports the estimated effects of VIE consolidation under FAS 166/167 on banks' mortgage approval and mortgage sale decisions, distinguishing banks based on the impact of VIE consolidation on their tier 1 risk-based capital ratio. Column 1 of the table reports the estimation of an expansion of equation (1), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage approval decisions, that interacts *Consolidated_VIE_Share* with *High_Capital_Ratio_Impact*. *High_Capital_Ratio_Impact* equals 1 (0) if the impact of VIE consolidation on a bank's tier 1 risk-based capital ratio in a given year is above (below) the median value for all treatment banks during that year; see appendix A for further details of the calculation of this variable. This model is estimated using the mortgage approval sample of 4,657,278 mortgage applications for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Approval*, equals 1 (0) if an application is approved (denied). Column 2 of the table reports the estimation of an expansion of equation (2), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage sale decisions, that interacts *Consolidated_VIE_Share* with *High_Capital_Ratio_Impact*. This model is estimated using the mortgage sale sample of 3,426,566 originated mortgages for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Sold*, equals 1 if an originated mortgage is sold to an unaffiliated party in the calendar year of approval and 0 if it is not sold. Both models include the same set of control variables and fixed effects as in table 2. Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by bank. *p*-values are reported in parentheses below coefficient estimates and are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

significantly negative (–0.209, $p < 0.001$), as is the coefficient on *Consolidated_VIE_Share* × *High_Capital_Ratio_Impact* (–0.493, $p < 0.001$). For the mortgage sale analysis in column 2, the coefficient on *Consolidated_VIE_Share* is significantly positive (0.803, $p < 0.001$), but the coefficient on *Consolidated_VIE_Share* × *High_Capital_Ratio_Impact*, while positive and large, is

insignificant in our two-tailed tests (0.814, $p = 0.140$), although it would be significant in a one-tailed test. These results are consistent with consolidation of VIEs under FAS 166/167 decreasing (increasing) mortgage approval (sale) rates significantly more for banks for which consolidation has an above-median impact on their tier 1 risk-based capital ratios.

The bottom of column 1 (2) of table 3 shows that banks' mortgage approval (sale) rates are significantly more negatively (positively) affected by the assets held by their consolidated VIEs than by the assets held by their unconsolidated VIEs, irrespective of whether consolidation has an above- or below-median impact on their tier 1 risk-based capital ratios.

4.5.2. Market Discipline over Banks. If market discipline over banks is the mechanism, we expect H1 and H2 to hold more strongly for banks subject to greater market discipline. To test for this mechanism, we conduct the mortgage approval and sale analyses distinguishing the treatment bank-year observations based on their dependence on short-term uninsured funding (the sum of repo financing, commercial paper, and other borrowed money with remaining maturities of less than one year, scaled by total assets and lagged by one year). Banks with greater dependence on short-term uninsured funding are subject to greater discipline from their creditors, since they must roll over that financing as it matures and so are subject to stronger market discipline from creditors at that time (Diamond and Rajan [2001], Bouther and Francis [2017]). The indicator variable *High_ST_Funding* takes a value of 1 (0) for above-median (below-median) dependence on short-term uninsured funding for a bank in a year.

Columns 1 and 2 of table 4 report the estimations of the expanded mortgage approval and sale equations for the full loan-level mortgage approval and sale samples, respectively, in 2005–2014. For the mortgage approval analysis in column 1, the coefficient on *Consolidated_VIE_Share* is significantly negative (–0.233, $p < 0.001$), as is the coefficient on *Consolidated_VIE_Share* × *High_ST_Funding* (–0.331, $p = 0.009$). For the mortgage sale analysis in column 2, the coefficient on *Consolidated_VIE_Share* is significantly positive (0.793, $p < 0.001$), as is the coefficient on *Consolidated_VIE_Share* × *High_ST_Funding* (0.694, $p = 0.096$). These results are consistent with consolidation of VIEs under FAS 166/167 decreasing (increasing) mortgage approval (sale) rates significantly more for banks with above-median dependence on short-term uninsured funding.

The bottom of table 4, column 1 (2), shows that banks' mortgage approval (sale) rates are significantly more negatively (positively) affected by the assets held by their consolidated VIEs than by the assets held by their unconsolidated VIEs, irrespective of banks' above- or below-median dependence on short-term uninsured funding.

4.5.3. Mortgage Risk. If banks prefer not to recognize high-risk mortgages on balance sheet, then we expect H1 and H2 to hold more strongly

TABLE 4
Partitioning on Market Discipline

	Dependent Variable = *Approval* 2005–2014 (1)	Dependent Variable = *Sold* 2005–2014 (2)
Consolidated_VIE_Share	−0.233***	0.793***
	(<0.001)	(<0.001)
Consolidated_VIE_Share × *High_ST_Funding*	−0.331***	0.694*
	(0.009)	(0.096)
OffBS_Securitization	0.014	0.103
	(0.683)	(0.332)
OffBS_Securitization × *Post*	−0.030	−0.297**
	(0.308)	(0.050)
Controls	Yes	Yes
Observations	4,657,278	3,426,566
Adjusted-R^2	0.15	0.49
Consolidated_VIE_Share + *Consolidated_VIE_Share* × *High_ST_Funding*	−0.564***	1.487**
	(0.001)	(0.011)
OffBS_Securitization + *OffBS_Securitization* × *Post*	−0.016	−0.194
	(0.460)	(0.278)
Difference:		
Consolidated_VIE_Share − *(OffBS_Securitization* + *OffBS_Securitization* × *Post)*	−0.218***	0.987***
	(<0.001)	(0.001)
Consolidated_VIE_Share + *Consolidated_VIE_Share* × *High_ST_Funding* − *(OffBS_Securitization* + *OffBS_Securitization* × *Post)*	−0.548***	1.681**
	(0.002)	(0.012)

This table reports the estimated effects of VIE consolidation under FAS 166/167 on banks' mortgage approval and mortgage sale decisions, distinguishing banks based on a proxy for the strength of market discipline. Column 1 of the table reports the estimation of an expansion of equation (1), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage approval decisions, that interacts *Consolidated_VIE_Share* with *High_ST_Funding*. *High_ST_Funding* equals 1 (0) if a bank has high (low) dependence on short-term funding, defined as the sum of repo financing, commercial paper, and other borrowed money with a remaining maturity of one year or less divided by total assets for the prior year is above (below) median of all sample banks during that year. This model is estimated using the mortgage approval sample of 4,657,278 mortgage applications for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Approval*, equals 1 (0) if an application is approved (denied). Column 2 of the table reports the estimation of an expansion of equation (2), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage sale decisions, that interacts *Consolidated_VIE_Share* with *High_ST_Funding*. This model is estimated using the mortgage sale sample of 3,426,566 originated mortgages for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Sold*, equals 1 if an originated mortgage is sold to an unaffiliated party in the calendar year of approval and 0 if it is not sold. Both models include the same set of control variables and fixed effects as in table 2. Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by bank. *p*-values are reported in parentheses below coefficient estimates and are indicated as follows: $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

for more risky mortgages. To test for this mechanism, we conduct the mortgage approval and sale analyses distinguishing loan-level mortgage applications and originations with above-median versus below-median loan-to-income ratios, denoted by the indicator variable *High_Loan_to_Income*, and separately distinguishing investment property (i.e., not occupied by the owner) from owner-occupied homes, denoted by the indicator

variable *Not_Occupied_By_Owner*.[25] As the results using the two mortgage risk indicator variables are similar, to conserve space we tabulate and discuss only the results for *Not_Occupied_By_Owner*.

Columns 1 and 2 of table 5 report the estimations of the expanded mortgage approval and sale equations for the full loan-level mortgage approval and sale samples, respectively, in 2005–2014. For the mortgage approval analysis in column 1, the coefficient on *Consolidated_VIE_Share* is significantly negative (–0.372, $p < 0.001$), as is the coefficient on *Consolidated_VIE_Share* × *Not_Occupied_By_Owner* (–0.074, $p = 0.023$). For the mortgage sale analysis in column 2 of table 5, the coefficient on *Consolidated_VIE_Share* is significantly positive (1.036, $p = 0.012$), as is the coefficient on *Consolidated_VIE_Share* × *Not_Occupied_By_Owner* (0.960, $p < 0.001$). These results are consistent with consolidation of VIEs under FAS 166/167 decreasing (increasing) banks' approval (sale) rates significantly more for mortgages on nonowner-occupied properties.

The bottom of table 5, column 1 (2), shows that banks' mortgage approval (sale) rates are significantly more negatively (positively) affected by the assets held by their consolidated VIEs than by the assets held by their unconsolidated VIEs, irrespective of whether the mortgages are on nonowner-occupied properties.

4.6 ADDITIONAL TESTS

4.6.1. Robustness to Alternative Samples with Reduced Heterogeneity. In the primary analyses, we control for heterogeneity of treatment and control banks by controlling for numerous bank characteristics and including bank fixed effects in the estimation models. To further ensure that our results are not attributable to heterogeneity regarding the extent of securitization by treatment versus control banks, we replicate the mortgage approval and sale analyses on three sets of restricted (i.e., more homogeneous) mortgage approval and sale samples. Specifically, we (1) eliminate all loan-level observations for bank-years with 0 values of *OffBS_Securitization* from the corresponding samples, (2) match each treatment bank to the control bank with the closest value of *OffBS_Securitization* at the end of 2006 (the last year prior to the financial crisis), or (3) eliminate all control bank observations. The first and second (third) sets of restrictions reduce the loan-level sample sizes by about 75% (over 80%). The results, reported in the online appendix, suggest that our inferences are essentially unaffected by the use of these alternative samples.

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[25] Mortgagors' stated intents regarding whether or not they will occupy mortgaged properties is a key input in credit rating models for (pools of securitized) residential mortgages (Griffin and Maturana [2016]). Research shows that mortgages on properties not occupied by the owner default at higher rates (Gao and Li [2012], Haughwout et al. [2014], Elul and Tilson [2015]). Banks typically require mortgagors who state that they will not occupy the property to make larger down payments and/or to pay higher interest rates (Elul and Tilson [2015]).

TABLE 5
Partitioning on Mortgage Risk

	Dependent Variable = *Approval* 2005–2014 (1)	Dependent Variable = *Sold* 2005–2014 (2)
Consolidated_VIE_Share	−0.372***	1.036**
	(<0.001)	(0.012)
Consolidated_VIE_Share × *Not_Occupied_By_Owner*	−0.074**	0.960***
	(0.023)	(<0.001)
OffBS_Securitization	0.025	0.088
	(0.468)	(0.397)
OffBS_Securitization × *Post*	−0.039	−0.281*
	(0.161)	(0.055)
Controls	Yes	Yes
Observations	4,657,278	3,426,566
Adjusted-R^2	0.15	0.49
Consolidated_VIE_Share + *Consolidated_VIE_Share* × *Not_Occupied_By_Owner*	−0.446***	1.997***
	(<0.001)	(<0.001)
OffBS_Securitization + *OffBS_Securitization* × *Post*	−0.015	−0.192
	(0.474)	(0.289)
Difference:		
Consolidated_VIE_Share − *(OffBS_Securitization* + *OffBS_Securitization* × *Post)*	−0.357***	1.229**
	(<0.001)	(0.014)
Consolidated_VIE_Share + *Consolidated_VIE_Share* × *Not_Occupied_By_Owner* − *(OffBS_Securitization* + *OffBS_Securitization* × *Post)*	−0.431***	2.189***
	(<0.001)	(<0.001)

This table reports the estimated effects of VIE consolidation under FAS 166/167 on banks' mortgage approval and mortgage sale decisions, distinguishing banks based on a proxy for mortgage risk. Column 1 of the table reports the estimation of an expansion of equation (1), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage approval decisions, that interacts *Consolidated_VIE_Share* with *High_ Not_Occupied_By_Owner. Not_Occupied_By_Owner* equals 1 if a mortgagor states that the property is not occupied by the owner (i.e., the property is an investment property), and 0 if the property is occupied by the owner. This model is estimated using the mortgage approval sample of 4,657,278 mortgage applications for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Approval,* equals 1 (0) if an application is approved (denied). Column 2 of the table reports the estimation of an expansion of equation (2), the model of the effect of VIE consolidation under FAS 166/167 on banks' mortgage sale decisions, that interacts *Consolidated_VIE_Share* with *Not_Occupied_By_Owner.* This model is estimated using the mortgage sale sample of 3,426,566 originated mortgages for 5,943 bank-year observations from 973 banks during 2005–2014. The dependent variable, *Sold,* equals 1 if an originated mortgage is sold to an unaffiliated party in the calendar year of approval and 0 if it is not sold. Both models include the same set of control variables and fixed effects as in table 2. Statistical significance levels are based on two-tailed *t*-tests with standard errors calculated clustering observations by bank. *p*-values are reported in parentheses below coefficient estimates and are indicated as follows: $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

4.6.2. Explaining the Dollar Amounts of Mortgage Approved or Sold. Our use of loan-level data and corresponding research design have numerous benefits discussed in the introduction and subsection 2.2. One potential drawback, however, is that all mortgage applications (originated mortgages) receive equal weight in the mortgage approval (sale) analysis regardless of the mortgages' dollar amounts (i.e., economic significance). To address this

concern, we estimate modifications of equations (1) and (2) that aggregate the loan-level mortgage approval and sale data to the bank-year level as follows. The dependent variable $\$Approved\_Loans$ is the natural logarithm of the aggregate dollar amount of mortgages approved by a bank in a year (in $ thousands). The dependent variable $\$Sold\_Loans\_to\_\$Approved\_Loans\_Ratio$ is the ratio of the aggregate dollar amount of mortgages sold by a bank in a year to the aggregate dollar amount of mortgages approved by the bank in that year. The models include all of the control variables as well as bank and year fixed effects. All loan-level variables (including MSA-year indicators) are averages for the bank-year. The tests, reported in the online appendix, yield the same inferences as the tests using the loan-level data in table 2.

4.6.3. Effect of Loan Type. Because different types of loans have different characteristics, ideally we would test the differential implications of on–balance sheet versus off–balance sheet recognition of securitized loans for banks' mortgage approval and sale decisions by type of loan. Unfortunately, banks' regulatory FR Y9-C filings do not break down on–balance sheet securitized loans by type, although they do break down off–balance sheet securitized loans by type. Using these available data, in untabulated analysis we replace *OffBS_Securitization* with its components attributable to securitized mortgages versus other types of securitized loans. Consistent with the results using overall off–balance sheet loans reported in table 2, the difference of the coefficient on *Consolidated_VIE_Share* and the sum of the coefficient on each component of *OffBS_Securitization* and its interaction with *Post* is significantly negative (positive) in the mortgage approval (sale) analysis.

4.6.4. Persistence of Effects. To test whether our primary findings persist over the 2010–2014 post-FAS166/167 period, in untabulated analysis we pool the 2005–2009 pre-FAS166/167 period with each year of 2010–2014 to form five subsamples and reestimate equations (1) and (2). For the mortgage approval (sale) analysis, we find a significantly negative (positive) coefficient on *Consolidated_VIE_Share* in each subsample. The persistence is consistent with findings in the banking literature of slow adjustment capital ratios to desired levels owing to sizable adjustment costs (Peltzman [1970], Mingo [1975], Marcus [1983], Flannery and Rangan [2008], Gropp and Heider [2010], Adrian and Shin [2011]).

5. Conclusion

Responding to concerns expressed by investors and policy makers that banks retained substantial risks in (opaque) off–balance sheet securitizations to the detriment of investors and the stability of the financial system, in 2009 the FASB issued FAS 166 and FAS 167, which tightened the rules governing the accounting for securitizations and the consolidation of

VIEs, respectively. Most of banks' VIEs are securitization entities. As a result of consolidating previously unconsolidated VIEs under FAS 166/167, our sample banks recognized sizable securitized assets on balance sheet. Because bank regulators decided to follow FAS 166/167, the standards effectively increased banks' regulatory capital requirements. This paper examines whether VIE consolidation under FAS 166/167 has real effects on banks' mortgage approval and sale decisions.

Using mortgage approval and sale decisions available in the HMDA database, we find that assets held by banks' consolidated VIEs under FAS 166/167 are statistically and economically significantly negatively associated with their mortgage approval rates and positively associated with their mortgage sale rates. Moreover, we find that these rates are influenced significantly more by the assets held by banks' consolidated VIEs than by the assets held by their unconsolidated VIEs, consistent with it being the consolidation of securitization entities rather than securitization per se that yields these effects.

Our models include extensive sets of control variables and fixed effects to capture heterogeneity across consolidating (treatment) bank and nonconsolidating (control) bank observations unrelated to FAS 166/167, including heterogeneity regarding the effects of the financial crisis. In addition, we conduct three sets of analyses to provide further confidence regarding the validity of our inferences and the robustness of our empirical results. First, in both the mortgage approval and mortgage sale analyses, we find insignificant results in falsification tests that treat the financial crisis as the event. We also replicate both analyses eliminating the prefinancial crisis years, which does not affect our inferences. Second, consistent with VIE consolidation being the mechanism underlying our results, we find stronger results for treatment observations with greater reduction in regulatory capital ratios due to FAS 166/167, higher dependence on short-term financing, and riskier mortgage applications and originations. Third, we find that our results are robust to the use of restricted samples in which banks exhibit a similar extent of securitization and to explaining the bank-year-level dollar volume of mortgages approved and sold rather than loan-level mortgage approval and sale rates.

Our evidence contributes to the literature on the real effects of accounting in general and of FAS 166/167 in particular. Our evidence also informs ongoing regulatory efforts to enhance financial system stability. It suggests that the higher capital requirements for banks consolidating VIEs under FAS 166/167 reduce these banks' mortgage risks through decreased mortgage approval rates and increased mortgage sale rates, with the latter effect driving mortgage risk into the less-regulated shadow banking system.

APPENDIX A
Variable Definitions

MAIN VARIABLES OF INTEREST

- **Approval**: Equals 1 (0) if a mortgage application is approved (denied).
- **Sold**: Equals 1 (0) if a mortgage is sold (not sold) in the calendar year of approval.
- **Consolidated_VIE_Share**: Assets held by consolidated VIEs under FAS 166/167 (the sum of bhckj981 through bhckj998 and bhckk003 through bhckk014), divided by the difference between total assets (bhck2170) and assets held by consolidated VIEs under FAS 166/167.
- **$Approved_Loans**: The natural logarithm of the aggregate dollar amount of mortgages approved by a bank in a year (in $ thousands).
- **$Sold_Loans_to_$Approved_Loans_Ratio**: The ratio of the aggregate dollar amount of mortgages sold to the aggregate dollar amount of mortgages approved by a bank in a year.

BANK-LEVEL CONTROL VARIABLES

- **OffBS_Securitization**: Principal balance of off-balance-sheet assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements (the sum of bhckb705 through bhckb711), divided by the difference between total assets and assets held by consolidated VIEs under FAS 166/167.
- **Post**: Equals 1 (0) for the 2010–2014 post-FAS 166/167 period (2005–2009 pre-FAS 166/167 period).
- **Stress_Test**: Equals 1 (0) if a bank is (is not) subject to supervisory stress tests conducted by the Federal Reserve. The Federal Reserve conducted stress tests for banks with consolidated assets of $100 billion or more in 2009 and 2011 and of $50 billion or more in each of 2012–2014.
- **Securities_Share**: The sum of available-for-sale securities (bhck1773) and held-to-maturity securities (bhck1754) divided by total assets.
- **Loan_Income_Share**: Interest and fee income on loans (the sum of bhck4435, bhck4436, bhckF821, bhck4059, and bhck4065) divided by the sum of total noninterest income (bhck4079) and interest and fee income on loans.
- **NPL**: The sum of loans 90 days or more past due (bhck5525) and loans no longer accruing interest revenue (bhck5526) divided by total loans (bhck2122).
- **Writedowns**: The sum of goodwill impairment (bhckc216), other-than-temporary impairments on investment securities recognized in earnings (bhckj320), and excess loan loss provision, divided by average total assets. Excess loan loss provision in year *t*, from 2005-2014, is measured as the difference between the loan loss provision (bhck4230) in year *t* and the normal loan loss provision in year *t*, estimated as the average of the bank's ratio of the provision for loan losses to average

total loans during 1995-2004 (requiring at least three years of this ratio to be available, otherwise the median ratio for all sample banks is used) multiplied by the bank's average total loans in year *t*. Other-than-temporary impairment data for 2008 and 2009 are hand collected from Form 10-K filings.

- **ROA_ex_Writedowns**: Income before writedowns, calculated as net income (bhck4340) plus writedowns as defined above, divided by average total assets.
- **Core_Deposit_Share**: The sum of deposits under $100,000 and transactions deposits (the sum of bhcb2210, bhcb3187, bhcb2389, bhcb6648, bhod3189, bhod3187, bhod2389, and bhod6648) divided by total assets.
- **WSF_Growth**: Annual growth in wholesale funding divided by lagged total assets. Wholesale funding is defined as the sum of large-time deposits (bhcb2604), deposits booked in foreign offices (the sum of bhfn6631 and bhfn6636), subordinated debt and debentures (the sum of bhck4062 and bhckc699), gross federal funds purchased (bhdmb993), repo financing (bhckb995), and other borrowed money (bhck3190).
- **Deposit_Rate**: Interest expense on deposits (the sum of bhcka517, bhcka518, bhck6761, and bhck4172) divided by average interest-bearing deposits (the sum of bhcb2389, bhod2389, bhcb6648, bhod6648, bhcb2604, and bhod2604).
- **Tier1_Capital_Ratio**: Tier 1 risk-based capital ratio (bhck7206).
- **Bank_Size**: The natural logarithm of total assets in 2006 dollars (in $ thousands).

LOAN-LEVEL CONTROL VARIABLES (FROM HMDA DATA SET)

- **Log_Applicant_Income**: The natural logarithm of applicant income (in $ thousands).
- **Loan_to_Income**: Loan amount divided by applicant income.
- **Log_Mortgage_Amount**: The natural logarithm of mortgage amount (in $ thousands).
- **High_Cost**: An indicator variable equal to 1 for loans that have high rates or high fees as defined in the (amended) Home Ownership and Equity Protection Act, and 0 otherwise.
- **Not_Secured**: An indicator variable equal to 1 if a mortgage is not secured by a lien, and 0 otherwise.
- **Gender**: An indicator variable equal to 1 (0) for female (male).

LOAN-LEVEL VARIABLES INCLUDED IN THE REGRESSIONS AS FIXED EFFECTS INTERACTED WITH YEAR FIXED EFFECTS (FROM HMDA DATA SET)

- **Conforming_Loan**: An indicator variable equal to 1 if the loan is a conforming loan eligible to be sold to GSEs such as Fannie Mae, and 0 if not.

- **Ethnicity**: An indicator variable equal to 1 if the applicant is Hispanic/Latino and 0 otherwise.
- **Race**: A categorical variable indicating whether the applicant is Asian, African American, native Hawaiian or other Pacific Islander, or white.
- **Loan_Type**: A categorical variable indicating whether the loan is conventional, insured by the Federal Housing Administration, guaranteed by the Veterans Administration, or guaranteed by the Farm Service Agency or Rural Housing Service.
- **Loan_Purpose**: A categorical variable indicating whether the loan purpose is for home purchase, home improvement, or refinancing.
- **Property_Type**: A categorical variable indicating whether the property is one- to four-family housing, manufactured housing, or multifamily housing.
- **Owner_Occupied**: An indicator variable equal to 1 (0) for the property is (is not) occupied by owner.

PARTITIONING VARIABLES

- **High_Capital_Ratio_Impact**: Equals 1 if *Impact_On_Tier1_Capital_Ratio* (defined below) in a given year is above the median for all treatment banks during that year and 0 otherwise.
    - **Impact_On_Tier1_Capital_Ratio**: The tier 1 risk-based capital ratio "as if" consolidated VIEs were not consolidated minus the reported tier 1 risk-based capital ratio (with these VIEs consolidated). The "as if" capital ratio is defined as "as if" tier 1 capital divided by "as if" risk-weighted total assets. "As if" tier 1 capital is calculated as reported tier 1 capital (bhck8274) plus loan loss reserves for loans held by consolidated VIEs (bhckj999+bhckk001+bhckk002). "As if" risk-weighted total assets is calculated as risk-weighted total assets (bhcka223) minus the risk-weighted assets of consolidated VIEs.[26] Schedule HC-V of banks' FR Y-9C filings provides 12 categories for the assets held by consolidated VIEs (e.g., cash, available-for-sale securities, and loans and leases). We calculate the risk-weighted assets of consolidated VIEs as the sum across these asset categories of the amount in each asset category times the risk weight of that category (assumed to equal the risk weight for that asset category for the bank holding company), less the bank's residual interest in the VIEs times the risk weight of available-for-sale securities for the bank (assuming that banks largely classify their residual interests in VIEs as available-for-sale securities). We determine the

[26] For the FAS 166/167 adoption year of 2010, we also add back the amount of VIE assets that are not subject to risk weighting (bhckj463) for the eight banks that choose the option to phase in the impact of FAS 166/167 on the calculation of their risk-weighted total assets.

risk weight for each asset category for the bank holding company from Schedule HC-R of the bank's FR Y-9C filings.

- **High_ST_Funding**: Equals 1 if a bank has high dependence on short-term uninsured funding and 0 otherwise. A bank is classified as having high dependence on short-term uninsured funding if the lagged value of its sum of repo financing (bhckb995), commercial paper (bhck2309), and other borrowed money with a remaining maturity of one year or less (bhck2332) divided by total assets for a given year is above (below) median of all sample banks during that year.
- **High_Loan_to_Income**: Equals 1 if the loan amount to applicant income ratio of a mortgage is above the median value for the MSA in a given year and 0 otherwise.
- **Not_Occupied_By_Owner**: Equals 1 if a mortgagor states that the property is not occupied by the owner (i.e., the property is an investment property), and 0 if the property is occupied by the owner.

Data items prefixed by bhck, bhcb, and bhod are obtained from banks' regulatory FR Y-9C filings.

APPENDIX B

Off-Balance-Sheet Securitization Activities During 2008–2010 for Banks that Consolidate at Least One Securitization Entity in 2011 Under FAS 166/167

	1– 4 Family Residential Loans			Home Equity Lines			Credit Card Receivables			Auto Loans		
	(1)			(2)			(3)			(4)		
Bank name	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
Cit Group Inc.	–	0	0	–	0	0	–	0	0	–	0	0
M&T Bank Corporation	–	–	9,898,165	–	–	0	–	–	0	–	–	0
JPMorgan Chase & Co.	324,442,000	242,988,000	197,910,000	436,000	286,000	338,000	85,571,000	84,626,000	0	1,475,000	579,000	124,000
Keycorp	0	0	0	0	0	0	0	0	0	0	0	0
Huntington Bancshares Incorporated	0	0	0	0	0	0	0	0	0	0	779,955	0
PNC Financial Services Group, Inc.	639,444	728,875	561,456	0	0	0	1,824,366	1,645,353	0	250,134	0	0
Fifth Third Bancorp	17,720	0	0	273,345	262,632	0	0	0	0	588,840	367,351	0
Bank of America Corporation	793,997,492	478,072,851	423,316,935	22,061,642	17,918,468	14,549,736	100,960,027	89,715,859	0	5,385,319	2,655,717	19,393
First Horizon National Corporation	22,411,669	18,107,935	14,635,853	210,608	170,797	0	0	0	0	0	0	0
State Street Corporation	0	0	0	0	0	0	0	0	0	0	0	0
Susquehanna Bancshares, Inc.	128,819	93,033	0	157,296	155,521	0	0	0	0	0	0	0
Wells Fargo & Company	262,321,000	297,307,000	332,697,000	5,143,000	4,752,000	0	0	0	0	4,137,000	2,471,000	0
Suntrust Banks, Inc.	126,023,438	141,933,436	126,899,759	0	0	0	0	0	0	0	0	0
Franklin Resources, Inc.	0	0	0	0	0	0	0	0	0	775,648	489,489	273,096
American Express Company	–	0	0	–	0	0	–	28,326,090	0	–	0	0
Ally Financial Inc.	–	97,269,000	70,033,000	–	2,340,000	1,382,000	–	0	0	–	7,475,000	0
Citigroup Inc.	540,838,000	67,729,000	54,646,000	657,000	539,000	0	107,571,000	111,309,000	0	0	0	0
Morgan Stanley	–	53,428,000	47,378,832	–	1,076,000	0	–	0	0	–	0	0
Capital One Financial Corporation	0	4,642,142	1,396,444	0	0	0	44,374,125	45,129,952	0	0	0	0
Goldman Sachs Group, Inc.	–	9,665,000	7,764,000	–	0	0	–	0	0	–	392,000	125,000
Metlife, Inc.	0	0	0	0	0	0	0	0	0	0	0	0
Bank of New York Mellon Corporation	533,000	466,000	379,000	0	0	0	0	0	0	0	0	0
Marlin Business Services Corp.	–	0	0	–	0	0	–	0	0	–	0	0
Discover Financial Services	–	0	0	–	0	0	–	0	0	–	0	0
Aggregate amount	2,071,354,590	1,412,432,281	1,287,518,454	28,940,899	27,502,427	16,271,746	340,302,526	360,754,263	0	12,613,949	15,211,521	543,499
$ change relative to the previous year		−658,922,309	−124,913,827		−1,438,472	−11,230,681		20,451,737	−360,754,263		2,597,572	−14,668,022
% change relative to the previous year		−31.8%	−8.8%		−5.0%	−40.8%		6.0%	−100.0%		20.6%	−96.4%

(*Continued*)

APPENDIX B—*Continued*

	Other Consumer Loans			Commercial and Industrial Loans			All Other Loans, All Leases, and All Other Assets		
	(5)			(6)			(7)		
Bank name	2008	2009	2010	2008	2009	2010	2008	2009	2010
Cit Group Inc.	–	0	0	–	765,466	0	–	215,758	0
M&T Bank Corporation	–	–	0	–	–	0	–	–	0
JPMorgan Chase & Co.	1,583,000	1,472,000	2,000	0	198,000	684,000	31,316,000	47,845,000	55,180,000
Keycorp	4,266,558	3,809,727	0	0	0	0	226,278	220,977	206,810
Huntington Bancshares Incorporated	0	0	0	0	0	0	0	0	0
PNC Financial Services Group, Inc.	0	0	0	0	0	0	1,167,042	772,417	372,803
Fifth Third Bancorp	0	0	0	0	0	0	0	0	0
Bank of America Corporation	526,049	455,394	393,072	0	3,443,050	3,017,479	49,106,732	55,514,186	50,647,447
First Horizon National Corporation	0	0	0	0	0	0	0	0	0
State Street Corporation	0	0	0	0	0	0	0	0	0
Susquehanna Bancshares, Inc.	0	0	0	0	0	0	123,609	0	0
Wells Fargo & Company	2,818,000	2,633,000	2,454,000	172,000	92,000	0	142,375,000	142,025,000	145,302,000
Suntrust Banks, Inc.	553,449	502,704	0	427,988	333,056	172,699	0	0	0
Franklin Resources, Inc.	0	0	0	0	0	0	0	0	0
American Express Company	–	0	0	–	0	0	–	0	0
Ally Financial Inc.	–	0	0	–	0	0	–	39,000	0
Citigroup Inc.	15,096,000	13,897,000	0	4,990,000	5,406,000	222,000	978,000	591,000	2,907,000
Morgan Stanley	–	0	0	–	0	0	–	10,901,000	7,108,000
Capital One Financial Corporation	2,621,464	1,947,056	1,392,515	0	0	0	0	0	0
Goldman Sachs Group, Inc.	–	0	0	–	5,877,000	2,294,000	–	9,232,000	8,683,000
Metlife, Inc.	0	0	0	0	0	0	0	0	0
Bank of New York Mellon Corporation	0	0	0	0	0	0	118,000	117,000	117,000
Marlin Business Services Corp.	–	0	0	–	0	0	–	0	0
Discover Financial Services	–	0	0	–	0	0	–	0	0
Aggregate amount	27,464,520	24,716,881	4,241,587	5,589,988	16,114,572	6,390,178	225,410,661	267,473,338	270,524,060
$ change relative to the previous year		−2,747,639	−20,475,294		10,524,584	−9,724,394		42,062,677	3,050,722
% change relative to the previous year		−10.0%	−82.8%		188.3%	−60.3%		18.7%	1.1%

Appendix B reports off-balance-sheet securitized assets during 2008–2010 for the 24 banks that consolidate at least one VIE in 2011 under FAS 166/167. Off-balance-sheet securitized assets are measured as the outstanding principal balance of off-balance- sheet assets that are sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements (the sum of data items bhckb705 through bhckb711 on FR Y9-C filings). Columns 1 to 6 report the amounts of off-balance- sheet securitized 1-4 family residential loans, home equity lines, credit card receivables, auto loans, other consumer loans, and commercial and industrial loans, respectively. Column 7 reports the amount of all other off-balance-sheet loans, leases, and other assets. The bottom three lines of the table report the aggregate amounts for the 24 banks, the changes in the aggregate amounts from the previous year, and the percentage changes in the aggregate amounts from the previous year. All monetary amounts are in $ thousands. Periods indicate missing values (i.e., that cannot be determined from FR Y-9C filings).

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