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Commercial Real Estate, Distress and Financial Resolution: Portfolio Lending Versus Securitization

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Abstract This paper examines the contrasting influence of portfolio lending and securitization in the resolution of distressed commercial real estate. The empirical analysis utilizes a large and unique data set of distressed commercial mortgages. The data set is constructed based on the recent financial crisis and includes portfolio and securitized loans. The main hypotheses address the marginal impact of portfolio versus securitized loans on the likelihood of resolution, resolution outcome, time to resolution and capital recovery rates. Conditional on a loan becoming troubled, we find that distressed commercial real estate loans held in a portfolio are more likely to be resolved and experience higher foreclosure rates compared to those that are securitized. Furthermore, portfolio loans experience shorter time to resolution and higher capital recovery rates when resolution is relatively swift. Our study is intended to contribute to the growing literature on distressed asset resolution and to provide new perspectives on how different lending options impact the financial resolution and workout process in a distressed commercial mortgage market.

Keywords Commercial real estate · Distressed debt · Securitization · Financial resolution

JEL Classification D8 · G1 · R33

Introduction

As a consequence of the recent economic and financial crisis, commercial mortgages experienced historically high default and delinquency rates. The overall delinquency

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rate of commercial multifamily mortgages climbed to 13.03 % in 2012. As a significant source of financing for commercial mortgages, the commercial mortgage-backed security (CMBS) has become an important player in the distressed real estate market. Delinquent and non-performing CMBS loans increased from approximately $14 billion in 2009 to over $90 billion in 2012. The enormous size of distressed CMBS loans poses a challenge to market participants; yet, they offer an opportunity to study how distressed loans in the commercial real estate market are resolved.

There is an important debate taking place in both academic and policy circles regarding whether securitization affects resolution outcomes of troubled loans, specifically whether securitization precludes loan renegotiation. A few recent studies have turned to the data and examine the issue. Piskorski, Seru, and Vig (2010) and Agarwal, Amromin, Ben-David, Chomsisengphet and Evanoff (2011) find that portfolio loans are more likely to be modified and less likely to be foreclosed upon, compared to securitized mortgages. Adelino, Gerardi and Willen (2013a) and Foote, Gerardi, Goette and Willen (2009) find no material difference in the rate of renegotiation between portfolio and securitized loans. These studies conclude that securitization does not impede renegotiations. The existing literature is largely inconclusive though the focus has been on the residential mortgage market. Little research has been published on commercial mortgages.

In this paper, we make the first attempt to explore the impact of securitization on financial resolution of distressed loans in the commercial real estate market. We construct a unique dataset that identifies distressed commercial loans/properties and track their performance and workout process during the period of 2008 Q1 to 2012 Q3.

We first examine whether securitization affects the likelihood of a distressed commercial real estate loan being resolved. We find that compared to securitized loans, loans held in a lender's portfolio are more likely to get resolved, either as being restructured or being liquidated. We also find that portfolio loans are more likely to be resolved within 6 and 9 months from becoming troubled. Second, we examine the impact of securitization on how the distressed commercial real estate loans are resolved. Specifically, we examine whether portfolio lending versus securitization affects the probability of a loan being foreclosed in contrast to being restructured. We find that portfolio loans are more likely to be foreclosed on and less likely to be restructured. We also find that portfolio loans are more likely to be liquidated or become lender REO. Third, we examine the relationship between securitization and time to resolution. We find evidence consistent with the claim that portfolio lenders have incentives to shorten time to resolution while special servicers in the securitization deal have incentive to prolong the workout process. On average, it takes 5–6 months longer for a securitized loan to get resolved, compared to a portfolio loan. Fourth, we examine the impact on capital recovery rates. We find that when a distressed loan is liquidated or foreclosed on within 6 months from becoming distressed, portfolio loans have higher recovery rates than securitized loans

This paper contributes to the literature in several aspects. First, our work is among the first to explore the role of securitization in the distressed commercial real estate market. Most of previous literature focuses on the residential mortgage market, i.e., Piskorski et al. (2010), Agarwal, et al. (2011), Adelino et al. (2013a, b) and Foote et al. (2009). This paper provides new and up-to-date evidence on how securitization affects financial resolution and workout of distressed commercial mortgages in the recent

period of 2008–2012. With the large number of defaults during the crisis, the commercial mortgage market provides a fertile ground to study financial distress and resolution. In contrast, the residential mortgage market is largely affected by Government Sponsored Enterprises (GSE). How servicers work out distressed loan might be influenced by GSEs. In our study, we focus on private-label or non-GSE commercial loans, which may provide a new perspective on how financial distress is resolved in the private market.

Second, this paper constructs and exploits a new and unique distressed commercial mortgage database to investigate financial distress and resolution in the commercial mortgage market. The larger and more comprehensive data provide more complete information than available to previous researchers. This allows us to model the securitization process and correct for sample selection bias in the empirical analysis. It also contains information about loan and property characteristics, making it possible to include more explanatory variables and to control for underwriting characteristics.

Third, we find that in the distressed commercial mortgage market, securitized loans are more likely to be restructured or modified and less likely to be foreclosed on, compared to portfolio loans. Our findings are in contrast with Agarwal et al. (2011) and Piskorski et al. (2010), which use residential mortgage data and are consistent with Adelino et al. (2013b). On one hand, our study could contribute to the recent debate regarding the role of securitization in both the academic and policy circles. On the other hand, our findings suggest that servicers might have different incentives in working out distressed commercial mortgages versus distressed residential mortgages.

Fourth, our studies extends the previous literature by examining not only the resolution outcome but the length of time from becoming troubled to being resolved, as well as the recovery rate. We find new evidence that portfolio loans experience shorter time to resolution and the recovery rates of portfolio loans are higher when the distressed loans are resolved within 6 months from becoming troubled. These results suggest that portfolio lenders might be more efficient in resolving distressed loans. Though we do not offer a direct test, our results are consistent with claims that special servicers in CMBS deals have incentives to prolong the workout process.

Fifth, our findings lay the groundwork for policy. This new perspective on how securitization affects financial resolution and workout in the commercial mortgage markets may offer insight on how to structure generations of CMBS (i.e., CMBS 2.0 and higher).

The rest of the paper is organized as follows. The next section offers a review of the literature and develops hypotheses. The subsequent two sections describe the data and sample, and, then, the descriptive statistics. Afterwards, we present the empirical methodology and results. Our conclusion is in the final section.

Literature Review and Hypotheses

Literature Review

The existing literature on distressed real estate focuses on default behavior and prepayment decisions, e.g., Ambrose and Sanders (2003), and Crockett (1990).

The literature on the strategy and process of distress resolution in the commercial real estate market is relatively sparse. We provide a brief overview as follows.

A few studies consider the theory of resolution of distressed debt and its implication on commercial loan defaults and workout strategy. Crockett (1990) presents a conceptual framework of issues related to the management of distressed real estate assets. The paper argues that the capacity to absorb negative cash flows plays a key role in determining the efficient holders of troubled assets, while informational asymmetries between holders and potential buyers are the dominant consideration in the disposition of distressed assets. By endogenizing negotiated workout into the usual noncooperative lending game, Riddiough and Wyatt (1994) shows that negotiated workout is a feasible subgame strategy for the lender when foreclosure transaction costs exist. Ciochetti and Riddiough (1998) examine the commercial mortgage foreclosure process using a sample of 480 defaulted commercial mortgages originated by a single, large life insurance company. They find that foreclosure time varies by property type, region of loan origination and year in which the mortgage is foreclosed. States classified as power-of-sale have approximately a two and one-half month shorter foreclosure period. The overall investment performance of modified-foreclosed loans is inferior to that of loans that are straight foreclosures. Brown (2000) compares the effects of the large decline in real estate values across properties with different ownership structures and financial leverage. He finds that highly leveraged owner-managed properties are more likely to be foreclosed. Harding and Sirmans (2002) study lender preference for maturity extension rather than principal renegotiation in the case of loan default. They argue that such preference exists because maturity extension better aligns the incentives of borrowers and lenders. Brown, Ciochetti and Riddiough (2006) develop a model of financial distress with an owner-managed project and empirically examine distress resolution using a large sample of defaulted commercial real estate loans from a single, large insurance company. They find that foreclosures occur more frequently with loans that default during the worst years of the downturn while restructuring is more prevalent as market conditions improve and a ready market for foreclosed properties exists.

A nascent literature explores the role of securitization on loan renegotiation in the residential mortgage market. Piskorski, Seru, and Vig (2009) examine the impact of securitization on loan servicing and whether securitization inhibits modifications of loans for distressed borrowers. They find that securitized loans are more likely to be foreclosed upon. Agarwal, Amromin, Ben-David, Chomsisengphet and Evanoff (2011) identify modification directly from the servicers' reports and provide a direct test of the impact of securitization on renegotiation rates. They find that the renegotiation rates of securitized mortgages are lower. Adelino, Gerardi and Willen (2013a) and Foote, Gerardi, Goette and Willen (2009) use an algorithm to identify renegotiations. Similarly and based on their algorithm, these latter studies find small renegotiation rates for securitized loans and loans held on banks' balance sheet. There is no material difference in the rate of renegotiation between portfolio and securitized loans. The authors of both studies conclude that securitization does not impede renegotiations. Adelino, Gerardi and Willen (2013b) employ the early-payment default analysis to examine the causal effect of securitization on the incidence of mortgage modification and foreclosure.

They find that securitized loans are more likely to be modified and less likely to be foreclosed on by servicers.

Another strand of literature empirically analyzes the role of special servicing in the resolution of distressed commercial mortgages. Gan and Mayer (2006) find that a small percentage of loans get liquidated more quickly when the special servicer owns the B-piece. However, special servicers delay liquidation when they hold the B-piece in mortgage pools with a larger percentage of delinquent loans. Ambrose, Sanders and Yavas (2010) examine the correlation between the default risk of commercial mortgage loans and whether, or not, the master and special servicing rights are held by the same firm. They find that 40.8 % of the loans in their sample include CMBS deals where the master and special servicing rights are held by the same firm. The time-in-default is shorter and the foreclosure rate is higher when the servicing rights are concentrated. Chen and Deng (2013) analyze both the servicers' choice of workout options and the borrower's default decision-making process. They find that cash flow is the most significant factor in the servicers' decision-making process; while, borrowers make default decisions based upon both the equity position in the mortgage and the cash flow condition in the space market.

Institutional Details

Commercial real estate first mortgage debt is generally broken down into two basic categories: (1) loans to be securitized, where many single mortgage loans of varying size, property type and location are pooled and transferred to a trust. The trust then issues a series of bonds that may vary in yield, duration and payment priority; and (2) portfolio loans, which are originated by a lender and held on its balance sheet through maturity. The default management and workout process is different between portfolio loans and securitized loans. Portfolio loans are owned, managed and serviced by the originating lender, such as a bank, an insurance company or a financial company. The original lender makes all decisions in the resolution of distress.

In contrast, a securitized loan is transferred by the originator to a trust with, potentially, many other loans. In this case, the original lender has little or no ongoing relationship with the borrower. The document governing the pool of securitized loans is called a Pooling and Servicing Agreement (PSA). This agreement is an important document governing the servicing and workout if the loan becomes distressed. The PSA appoints a master servicer to act on behalf of the trust and administer the loans on a day-to-day basis. Another difference is that securitized commercial loans often are tranched into multiple classes, both within the mortgage and sometimes also including one or more classes of mezzanine loans. When a securitized loan fails to perform as expected, the special servicer, typically appointed through the PSA, takes over responsibility for managing distressed loans and functions as an agent between borrowers and investors. The rights, duties and compensation of special servicers are set out in a PSA. Special Servicers are normally compensated by receiving a percentage of the unpaid balance on the loans they service. The fee rate can be anywhere from one to twenty five basis points depending on the size of the loan, whether it is secured by residential or non-residential real estate, and the level of service required.

Hypotheses

Several factors may affect the final resolution of financial distress: (1) contracting frictions, (2) asymmetric information, (3) agency conflicts, and (4) regulatory influence. Servicers of portfolio loans and securitized loans in the commercial real estate market may have different incentives in resolving distress. In this section, we develop the hypotheses centering on the impact of portfolio versus securitized loans on four aspects of the workout process. These aspects include the likelihood of a distressed loan being resolved, how the servicer chooses one workout strategy versus another, the length of time for a distressed loan to get resolved and the capital recovery rate upon final resolution.

Contracting Frictions

As pointed out in the institutional details, portfolio lenders are the sole decision-maker in the workout process. They have more flexibility in terms of choosing a workout strategy and also fully internalize the costs and benefits of any resolution decision. We expect that portfolio lenders are likely to take prompt actions to resolve distress. The likelihood of a distressed portfolio loan getting resolved is higher and the length of time taken to reach resolution is shorter. In addition, portfolio lenders, such as banks, tend to avoid write downs and may choose to restructure instead of foreclosing on a distressed loan.

For securitized loans, the PSA governs the servicing and may place restrictions on the number and type of modifications a servicer can perform, which impedes the process of loan restructure. Furthermore, the multi-tranche structure of securitized loans can result in a much more contentious workout process. Different investors may have competing interests. Consequently, the disagreements among investors in renegotiation could be greater than those with borrowers. The securitized loans are more likely to be foreclosed on and the time to resolution could be longer.

Asymmetric Information

Adelino et al. (2013b) develop a theoretical model and show that restructure rates are negatively correlated with the degree of informational asymmetries between borrowers and lenders. On the one hand, portfolio lending is often referred to as relationship lending. Portfolio lenders might possess soft information about the underlying loan and borrower when evaluating loan defaults. The reduced information asymmetry between a borrower and portfolio lender may lead to a smoother negotiation process, compared to special servicer in the securitization situation. It may also shorten the time needed to acquire information related to borrower and property and thus lead to a shorter time to resolution.

On the other hand, in the presence of greater uncertainty, servicers may choose to foreclose a distressed loan even when the losses from the foreclosure may exceed those from restructure. Some situations include those where a portfolio lender faces a large number of defaulters in the balance sheet or the potential of commercial mortgage re-default is high. Both may lead to barriers in renegotiation and preferences in foreclosure.

In addition, the information asymmetry is higher when dealing with commercial mortgages. The borrower may know more about underlying property value and profitability. Given the large size of commercial mortgages, servicers may incur higher

losses if they choose to restructure or modify a distressed loan which has a probability of curing. Hence, they may choose to foreclose ex-ante to minimize loss.

While the conduit lenders contribute to the moral hazard problem in loan origination, portfolio lenders cause the adverse selection in the choice of loans for securitization. Both suggest that portfolio loans, or loans held on the lender's balance sheet, have higher quality and underwriting standard. In addition, portfolio lenders tend to monitor loans more closely. We expect that the owners of distressed loans held in a portfolio are less likely to incur additional risks and/or delay necessary capital improvements or renovations. Consequently, a distressed loan with better underwriting and monitoring might result in a smaller loss and are less likely to be liquidated at a sub-optimal value. The capital recovery rate of liquidated portfolio loans could be higher than those of securitized loans.

Agency Conflicts

When a securitized loan becomes distressed, the special servicer takes over responsibility for managing distressed loans and functions as an agent between borrowers and investors. The special servicer may not always behave in the best interest of the investors and investors might lack the ability to effectively monitor special servicer effort. This condition creates an agency issue during the workout process. First, the role of the special servicer may be influenced by their compensation structure, e.g., Fan et al. (2006), and Liu and Quan (2013). Special servicers are generally compensated by a percentage of the outstanding balances of the loans under special servicing. For this reason, a special servicer may generate more profit if they can service a particular loan for a longer period. Such compensation structures may give special servicers an incentive to prolong the workout process and to choose a workout strategy that may extend the servicing period, such as restructure.

Second, special servicers have a fiduciary responsibility to maximize the capital recovery of distressed properties for CMBS investors. The concern about legal liability from unsatisfied investors may incentivize special services to pursue higher recovery rates. It may also incentivize a special servicer to choose to foreclose on a property. The lender-owned property will be put through an auction process to elicit a fair price, whereby the fiduciary can show they have met their responsibility. However, Adelino et al. (2013a) points out that according to lender's own filings with the SEC, foreclosures reducing the value of special servicing rights whereas modifications increase them.

Regulatory Influence

Portfolio lenders, banks in particular, are subject to regulatory scrutiny. After the financial crisis, portfolio lenders, banks in particular, are under regulatory pressure to clean up their balance sheets and hence, have incentives to liquidate or foreclosure the distressed loans. In addition, regulatory accounting for troubled debt restructurings may pose a potential problem and hinder renegotiation.

Table 1 summarizes the theoretical predictions on how portfolio lending relative to securitization impacts financial resolution of distressed commercial loans. The column labeled Current Research Hypotheses correspond to the testable implications addressed in our work.

Table 1 Testable implications and hypotheses

The impact of portfolio lending relative to securitization on the …	Current Research Hypotheses	Contracting Conflicts	Asymmetric Information	Agency Conflicts	Regulatory Influence
… likelihood of being resolved:	+	+		+	
… likelihood of being foreclosed on versus being restructured:	+/−	+/−	+/−	+/−	+
… length of time from becoming troubled to being resolved:	−	−	−	−	
… capital recovery rates:	+/−		+	−	

Our hypotheses are as follows:

Hypothesis 1 Relative to all loans (i.e., portfolio loans and securitized loans), portfolio-held loans are more likely to get resolved.

Hypothesis 2A Relative to all loans (i.e., portfolio loans and securitized loans), portfolio-held loans are more likely to be foreclosed upon and less likely to be restructured.

Hypothesis 2B Relative to all loans (i.e., portfolio loans and securitized loans), portfolio-held loans are less likely to be foreclosed upon and more likely to be restructured.

Hypothesis 3 Relative to all loans (i.e., portfolio loans and securitized loans), portfolio loans experience shorter time to resolution.

Hypothesis 4A The capital recovery rate of foreclosed loans that are held in a portfolio is higher than those of foreclosed loans that are privately securitized.

Hypothesis 4B The capital recovery rate of foreclosed loans that are held in a portfolio is lower than those of foreclosed loans that are privately securitized.

As shown above, it becomes an empirical question as to which factor(s) dominate in determining the financial resolution of distressed loans in the commercial real estate market. For this reason Hypotheses 2 and 4 are shown in (competing) alternative forms. The null hypothesis, in all cases, states that resolution outcomes are no different between portfolio loans and those that have been securitized.

Data

The distressed commercial real estate data is from Real Capital Analytics (RCA).[1] RCA is a leading data provider which collects detailed loan and transaction data on commercial properties with values of $2.5 million and above. Since 2008, RCA has taken the step of expanding their research program to track economic distress in the commercial real estate market. The data identifies troubled/distressed assets and tracks their performance and financial resolution. The distressed status is updated across the lifecycle of a property.

[1] We gratefully acknowledge Real Capital Analytics (RCA) for assisting us with the data.

We construct a unique dataset by merging RCA's troubled asset database with its loan and property databases, to capture information about property characteristics and loan characteristics of each distressed real estate asset. Our sample includes commercial mortgages that became troubled beginning in the first quarter of 2008 and tracks the performance of those mortgages until the third quarter of 2012. The start of the sample coincides with the date where RCA has a more comprehensive coverage of distressed commercial real estate loans. We include only the purchase money mortgages and exclude those used to refinance an existing loan. In addition, we limit our sample to non-GSE loans. All loans in our sample are originated in or before 2009 and hence, fall under the category of CMBS 1.0.[2] Our final sample includes 4054 distressed commercial mortgages.[3]

Portfolio Loans Versus Securitized Loans

RCA provides an indicator to identify whether a loan is securitized or not. The lender name and lender type are also recorded. In our sample, the types of portfolio lenders include banks, insurance companies, pension funds and other financial companies. Loans are often securitized at origination, either by a lender with the sole purpose of securitization (referred to as conduit lender) or as a single loan into a CMBS deal. [4] For securitized loans, RCA provides the originator name, special servicer name and some information about the security. We include only the loans that are securitized through private-label mortgage backed securities.

Troubled Status

There is no consensus in defining distress in both the finance and real estate literatures. In general, data availability determines the definitions. RCA identifies economic distress at three levels, namely loan, property and borrower levels. They include commercial mortgages or properties that are either troubled or potentially troubled (where loans or properties are not yet distressed, but may likely become so).[5] We make every effort to go through RCA data on each distressed event and exclude all the observations that may be potentially troubled. We define a commercial mortgage or property as troubled or distressed if it experienced one of the following distress events:

[2] In August 2010, Goldman Sachs, Citigroup and Starwood joined together to issue the $788.5 million GS Mortgage Securities Trust 2010-C1 ("GSMST Transaction"). The GSMST Transaction was really the first deal in the U.S. to implement significant changes into the standard CMBS transaction. Although the term of CMBS 2.0 had been used for some time before, the GSMST Transaction is considered the first U.S. CMBS transaction to implement CMBS 2.0. All loans in our sample were originated before 2009 and hence, all fall into the category of CMBS 1.0.

[3] We start with 11340 commercial mortgages that become troubled at some point during the sample period. After deleting observations where we cannot identify the lender and do not have loan or property characteristics data at origination, we have 4054 observations in the final sample.

[4] Mortgages can be securitized at a later data after origination. We don't have data to identify such . However, Ghent and Valkanov (2013) finds that less than 3 % of non-conduit originations in the CMBSs, after merging the RCA data with TREPP loan data. An, Deng and Gabriel (2011) also shows that the majority of commercial real estate loans are securitized at origination or not at all. Given the rarity of portfolio loans being securitized at a date after origination in practice, we expect that our main conclusion remains.

[5] The potentially troubled situations include tenant bankruptcies, owners financially troubled, mezzanine takeover, slow lease-up, etc.

being in delinquency/default, being transferred to special servicer, foreclosure initiated, maturity default [6] and borrowers being in bankruptcy. [7]

Financial Resolution Outcomes

We identify whether a distressed loan is resolved and categorize the resolution outcome based on RCA data for the distressed event. For each distressed loan, RCA provides a detailed description about the event that triggered distressed status and what happened during the distressed cycle. We classify the resolution outcomes into two major categories, namely restructure and liquidation. Restructure includes loan refinancing, modification and extension. Liquidation includes foreclosure and disposition through other non-foreclosure practices, such as short sale, receivership sale and conventional sale. Foreclosure includes lender REOs, trustee sales and foreclosure post-sales. We categorize the loans that are either restructured or liquidated by the end of our sample period as being Resolved. Otherwise, the loans are categorized as remaining troubled. It is worth noting that our measure of resolution outcome indicates the completion of the workout process, meaning restructure or foreclosure is successfully completed. A distressed loan that is in the renegotiation process but has not reached an agreement is categorized as troubled or distressed. The process from a loan or a property becoming troubled to get resolved is summarized in Fig. 1.[8]

Time to Resolution

RCA records the key dates to signify the start of the distressed cycle, the date when the distressed event happened and the end of the cycle if the distressed loan is resolved, the date when the restructure or liquidation completed. RCA also provides the date when a distressed property becomes lender REO property. We measure Time to Resolution as the number of months from a loan or property becoming troubled to the date of final resolution either as being liquidated or restructured. We also calculate the Time to Foreclosure as the number of months from the loan or property becoming troubled to the date when foreclosure is completed, including lender REO.

Different distress events correspond with different starting points in the distress cycle. To ensure consistency, we employ a strict distress definition and construct a sub-sample. We limit each case to one distress event, as in delinquency/default and then track the performance and workout of the loan. In the sub-sample analysis, we measure time to resolution and time to foreclosure as the number of months from a loan being in delinquent/default to being resolved or foreclosed on.

[6] Maturity default refers to the loans that are known to be past maturity but a new financing arrangement is unknown.

[7] It is unclear how RCA records those loans that became current. In our sample, the distressed loans are either resolved or remain troubled.

[8] RCA classifies the distress status into four major groups – Troubled, Restructured/Extension and Resolved. Troubled includes foreclosures, borrower bankruptcy and Lender REO. Restructured is the status where the ownership or debt terms of the mortgage have changed but a long term solution to the cause of distress may not have been reached. Resolved is the status where properties have moved out of distress via refinancing or through a sale to a financially stable third party. However, their classification is rather broad. Hence, we reclassify the resolution outcome based on RCA data and descriptions of each troubled event. In addition, RCA troubled asset data does not include loans that return to "current" status. We also do not have sufficient information to identify whether loans re-default.

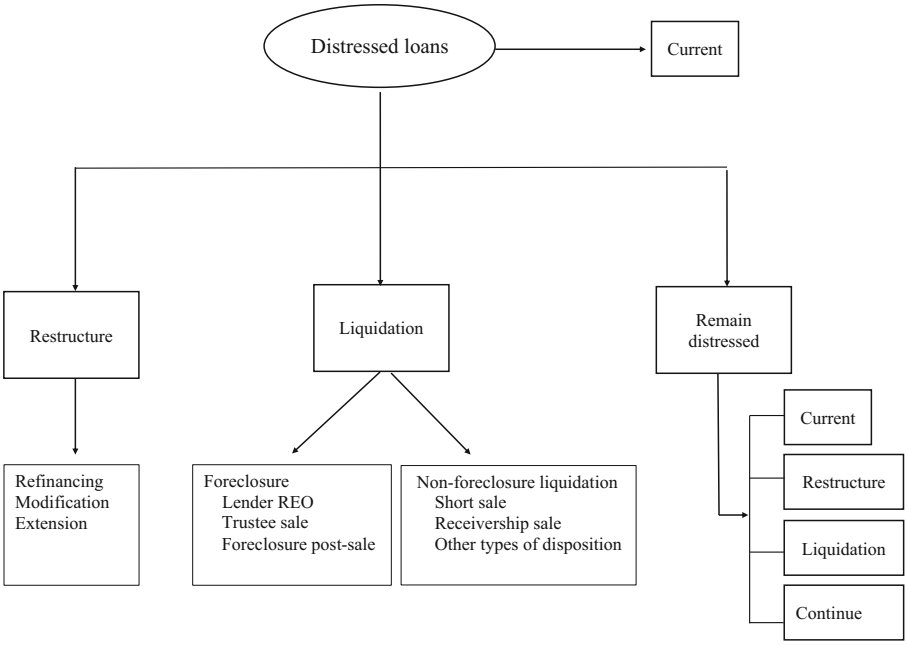


Fig. 1 Financial resolution of distressed loans

Capital Recovery Rate

We measure the Capital Recovery Rate as gross proceeds from the liquidation over the total unpaid balances of the first mortgage loan when the distressed event occurred. We further differentiate the liquidated loans into the loans that are disposed through foreclosure and those that are liquidated through non-foreclosure processes, such as short-sell. We then calculate the capital recovery rate for both types of liquidation process. We caution that our recovery rate is a proxy measure. We do not have information about other types of distressed costs, such as accrued interest, property maintenance expenses and foreclosure expenses, and hence, our measure is limited.

Other Variables

We include additional variables to control for underwriting and loan characteristics at origination, including the loan-to-value (LTV) ratio at origination, the number of months from origination to the date the property becomes troubled (LoanAge), the natural log of the total unpaid balance at the first indication of distress (DistressedSize),[9] whether the distressed loan is fixed-rate (FixedLoan) and whether the loan term is 15 years or longer (TermLong).

We also include variables to control for property characteristics, including property type, whether the property is located in the central business district (CBD) and variables to indicate the regional location of the property. In addition, resolution of distress might

[9] RCA provides the estimate of total outstanding balance at the start of distressed cycle. In our sample, there are 28 development loans that have increasing balances over time. Their outstanding balances are higher than the loan amounts at origination. We also use the loan amount at origination as a proxy for distressed size. In various sensitive and robustness checks, the main conclusions remain.

be affected by state foreclosure laws (Pennington-Cross, 2003; Clauretie and Herzog, 1990). We include a dummy variable to indicate whether the property is located in States that have strict foreclosure laws and experience significantly longer foreclosure processes (StatesLong), including Florida, Hawaii, Illinois, New Jersey and New York. In summary, Table 2 defines our set of variables.

Summary Statistics

Distressed Commercial Real Estate Market

Figure 2 shows the number and total outstanding balance of loans that become distressed in a given year during our sample period of 2008 Q1 to 2012 Q3. In our sample, there is a spike in 2009 with the number of loans becoming distressed reaching 1164 and total outstanding balance reaching $21,369.2 million. Compared to 2008, the number of newly distressed loans almost quadrupled and their total outstanding balances tripled in 2009. There is a significant decrease since then, which indicates the improving real estate market condition.

The distress is more severe in the securitized commercial mortgage market. There are more securitized loans that became distressed and the outstanding balance is higher in each year during our sample period. This finding is consistent with previous literature suggesting higher default rates in the securitized market. For total outstanding balance, both distressed portfolio and securitized loans follow a similar trend, with a sharp increase in 2009 and slowing down afterwards. The number of securitized loans becoming distressed reaches the highest point in 2009 while most of portfolio loans become distressed in 2010. The chart also shows that the decrease in the number of newly distressed loans is larger in portfolio lending.

Table 3 shows the descriptive statistics of distressed loans by different categories. In our sample, 61.3 % of distressed loans are securitized, 30.9 % held by bank and 7.8 % held by non-bank portfolio lenders, including insurance company, pension fund and other types of financial companies. Securitized commercial mortgages show a larger scale of distress with a total outstanding balance of about $50 billion. This compared to about $21 billion for commercial mortgages held in a portfolio. About 26.1 % and 24.3 % of distressed commercial mortgages are secured by office and apartment properties, respectively. This equates to a total outstanding balance of distressed loans secured by office and apartment properties of $29.2 billion and $14.4 billion, respectively. In terms of regions, the percentage of distressed commercial real estate loans is highest in the Southeast and West regions at 28.5 % and 24.4 %, respectively. The total outstanding balance of distressed loans is about $17.2 billion in the West region and about $15.4 billion in the Southeast region. About 50 % of distressed loans in our sample are originated in years 2005 and 2006, immediately prior to the recent financial crisis. The total outstanding balance of those distressed loans is over $35 billion.

Table 3 also presents the average time to resolution and average recovery rate in different category. Securitized loans experience a longer time to resolution with an average time to resolution of 13.3 months, compared to 7.6 months for portfolio loans. The average recovery rate of securitized loans is 69.3 % and of portfolio loans is 69.1 %. Among different property types, distressed loans secured by apartment and hotel

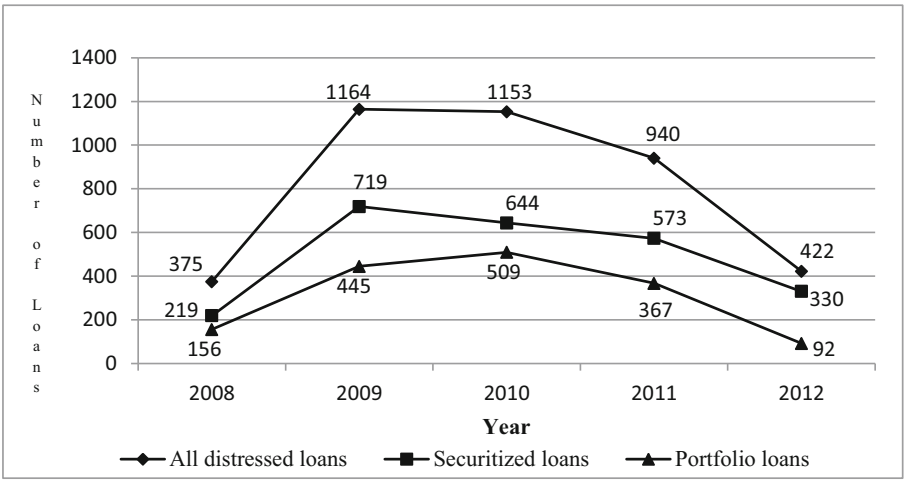
Table 2 Definition of variables

Variables	Measures
Financial Resolution Variable	
Resolved	Variable to indicate the distressed loans are resolved through restructure or liquidation
Restructure	Variable to indicate restructure as the resolution outcome, which includes loan refinancing, loan modification and extension
Liquidation	Variable to indicate liquidation as the resolution outcome, which includes foreclosure and other types of liquidation, such as short sale and receivership sale
Foreclosure	Variable to indicate foreclosure as the resolution outcome of distressed loans, which includes lender REO, trustee sale, foreclosure post-sale
LenderREO	Variable to indicate lender REO as the resolution outcome
TimeToResolution (TimeToForeclosure)	Number of months from the loan becoming troubled to final resolution, either as being restructured or liquidated (or being foreclosed)
RecoveryRate	Resolved proceeds (or gross proceeds from the disposition)/total outstanding balance of the first mortgage loan at the time of default
Lending Type Variable	
PortfolioLoan	Indicator variable equals 1 if the loan is held in lenders' portfolio
Underwriting/Property Characteristics	
DistressedSize	Natural log of total outstanding distressed balance
LoanAge	Number of months from the loan origination date to the date that the loan became distressed
LTV	Loan-to-Value ratio at origination
FixedLoan	Indicator variable equals 1 if a fixed-rate mortgage
TermLong	Indicator variable equals 1 if loan term is 15 years or longer
DSCR	Debt service coverage ratio at origination
CapRate	NOI/Value, ratio of net operating income divided by the property value at origination
OrigYear	Year that the loan was originated
OccupancyRate	Occupancy rate at origination
YearBuilt	Year that the property was built
PricePerSF	Price per square feet of the property
NumBuilding	Number of buildings in the property
Property type indicators	Variables to indicate whether the property type is apartment, hotel, industrial, office or retail
Location Variables	
CBD	Indicator variable equals 1 if the property is located in the central business district
StatesLong	Indicator variable equals 1 if the property is located in states with long foreclosure process, including New York, New Jersey, Florida, Hawaii and Illinois.
Region indicators	Variables to indicate whether the property is located in East (Northeast and Mid-Atlantic), South (Southeast and Southwest), Mid-west and West

Table 2 (continued)

Variables	Measures
Market Conditions	
MarketIndex	Cumulative NCREIF property index return of five core property types over the sample period, namely apartment, hotel, industrial, office and retail

A.



B.

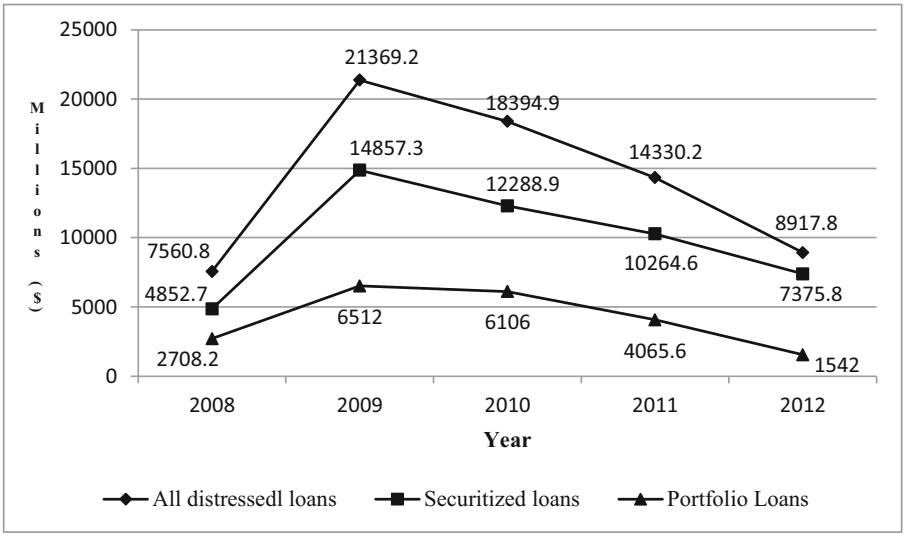


Fig. 2 The number and outstanding balance of commercial real estate loans that became troubled in a given year during the sample period 2008Q1-2012Q3

Table 3 Summary statistics of distressed commercial real estate loans

	# of distressed loans	% of loan	Total outstanding balance (million)	Average time to resolution (months)	Average recovery rate (%)
By lender type					
Securitized loans	2485	61.3	49639.2	13.3	69.3
Portfolio loans	1569	38.7	20933.8	7.6	69.1
- held by banks	1252	30.9	15126.3	7.9	68.0
- held by others	317	7.8	5807.5	6.5	72.5
By property type					
Office	1059	26.1	29240.0	11.0	66.4
Apartment	974	24.0	14420.6	10.3	73.8
Retail	932	23.0	12280.5	11.5	61.2
Industrial	641	15.8	5494.2	11.1	72.8
Hotel	448	11.1	9137.7	10.4	70.8
By loan size					
<$2m	222	5.5	522.6	10.6	71.9
$2m–$4m	776	19.1	2300.1	8.8	74.6
$4m–$7m	892	22.0	4859.7	9.9	67.2
$7m–$15m	974	24.0	10003.7	11.2	66.6
$15m–$25m	542	13.4	10477.9	12.6	67.2
>$25m	648	16.0	42408.9	12.3	70.4
By region					
West	1163	28.7	17228.8	10.2	71.9
Southeast	992	24.5	15401.0	10.6	64.8
Southwest	817	20.2	11699.2	9.7	66.1
Midwest	551	13.6	8169.4	13.7	67.7
Northeast	325	8.0	12573.9	11.6	77.4
Mid-Atlantic	206	5.1	5500.8	13.0	74.7
By origination year					
Prior to 2004	230	5.7	2754.4	10.9	69.3
2004	375	9.3	6352.1	10.6	73.4
2005	830	20.5	14382.7	11.6	67.1
2006	1189	29.3	21233.6	11.7	67.7
2007	1260	31.1	23573.8	10.3	69.6
2008	145	3.6	2151.4	6.6	74.4
After 2008	25	0.6	125.0	3.2	85.3
All distressed loans	4054	100.1	70573.1	10.8	70.1

This table presents the summary statistics of distressed commercial real estate loans. The sample tracks the resolution of commercial real estate loans from 2008 Q1 to 2012 Q3. All distressed loans were current at the end of 2007 and became troubled since the first quarter of 2008. There is no restriction on the date of origination. The summary statistics cover the number and percentage of distressed loan, total outstanding balances of first mortgage loans, average time to resolution and average recovery rate by lending type, property type, loan size, region and origination year

properties experience shorter time to reach resolution at about 10 months and distressed loans secured by apartment properties have higher average recovery rate at 73.8 %. The distressed loans of properties in the Midwest region have the longest time to resolution at 13.7 months while the distressed loans of properties in the Northeast region show the highest recovery rate at 77.4 %. We also find that distressed loans originated in year 2005 and 2006 experience longest time to resolution, at about 12 months. Distressed loans originated in year 2008 and after have higher recovery rates at over 70 %.

Portfolio Loans Versus Securitized Loans

Table 4 presents the summary statistics of all distressed commercial loans in our sample and across securitized and portfolio loans. The univariate t-test statistics comparing two types of lending is shown in the last column. There are systematic differences in the characteristics of distressed portfolio loans and distressed securitized loans. Compared to distressed portfolio loans, distressed securitized loans have lower loan-to-value ratio at origination (73 % vs. 96 %), larger distress size ($20 m vs. $13 m), more seasoning (i.e., longer time from origination, 54 months vs. 45 months), higher percentage of fixed-rate mortgages (97 % vs. 24 %), smaller percentage with loan terms over 15 years (0.2 % vs. 1 %), higher cap rates at origination (7.17 % vs. 6.73 %). The big differences in LTV and whether the distressed loan is fixed rate are worth noting. There is no significant difference in average debt service coverage ratio at origination, with securitized loans at 2.02 and portfolio loans at 1.4. Most of the distressed securitized and portfolio loans in our sample are originated in 2005–2006.

There are also substantial differences in the characteristics of properties financed with securitized loans versus with portfolio loans. Securitized loans are associated with properties that have higher occupancy rate at origination (91 % vs. 77 %), lower price per square feet (173.3 vs. 193.4) and multiple buildings. Properties financed with securitized loans are about ten years younger than those financed with portfolio loans. Securitized loans are more likely to finance office buildings, properties located in the South region (including Southeast and Southwest), and are less likely to finance properties located in the central business district. About 20 % of distressed securitized loans and 24 % of distressed portfolio loans are located in States that may experience longer foreclosure processes.

More importantly, Table 4 shows the difference in resolution outcome between portfolio loans and securitized loans. During our sample period, the percentage of distressed loans resolved through foreclosure (49 %) or liquidation (56 %) is substantially higher than those that are restructured (6 %). The difference-in-mean test statistics show a significant difference in how distress is resolved across securitized and portfolio loans. The percentage of portfolio loans resolved through foreclosure (59 %) or liquidation (67 %) is higher than that of securitized loans, 42 % and 49 % respectively. The average time to resolution is 10.84 months and the average time to foreclosure is 10.36 months. The difference-in-mean test statistics also confirms the significant difference in time to resolution between securitized loans and portfolio loans. It takes on average about 14 months for securitized loans to become resolved, which is about 6 months longer than that of portfolio loans. The average recovery rate is 70 % for a liquidated property. On average, the recovery rate of a property that is sold during foreclosure process is lower, compared to a property that is sold during non-foreclosure

Table 4 Summary statistics of dependent and independent variables

Variable	All distressed loans			Portfolio loans			Securitized loans			Difference-in-mean test
	N	Mean	Std	*N*	Mean	Std	*N*	Mean	Std	
Resolved	4054	0.62	0.48	1569	0.69	0.46	2485	0.58	0.49	(0.000)
Restructure	4054	0.06	0.24	1569	0.02	0.15	2485	0.09	0.28	(0.000)
Liquidation	4054	0.56	0.50	1569	0.67	0.47	2485	0.49	0.50	(0.000)
- Foreclosure	4054	0.49	0.50	1569	0.59	0.49	2485	0.42	0.49	(0.000)
- LenderREO	4054	0.36	0.48	1569	0.42	0.49	2485	0.32	0.47	(0.000)
TimeToResolution	2523	10.84	9.10	1086	7.55	7.49	1437	13.33	9.42	(0.000)
TimeToForeclosure	1981	10.36	9.10	926	7.05	6.98	1055	13.27	9.73	(0.000)
RecoveryRate -Liquidation (%)	1548	69.18	0.27	795	69.08	0.26	753	69.28	0.28	(0.883)
RecoveryRate -Foreclosure (%)	1257	66.67	0.26	670	66.96	0.26	587	66.35	0.26	(0.680)
RecoveryRate -Non-foreclosure (%)	291	79.98	0.29	125	80.44	0.24	166	79.63	0.32	(0.815)
LTV	4054	0.82	0.65	1569	0.96	1.00	2485	0.73	0.16	(0.000)
DistressedSize ($ m)	4054	17.41	35.61	1569	13.34	33.94	2485	19.98	36.4	(0.000)
LoanAge	4054	50.14	20.33	1569	44.75	18.75	2485	53.55	20.55	(0.000)
FixedLoan	4054	0.69	0.46	1569	0.24	0.43	2485	0.97	0.18	(0.000)
TermLong	4054	0.01	0.08	1569	0.01	0.10	2485	0.01	0.07	(0.046)
CapRate (%)	2114	7.10	0.02	345	6.73	0.02	1769	7.17	0.02	(0.000)
DSCR	2252	2.01	28.01	20	1.4	0.28	2232	2.02	28.12	(0.922)
OrigYear	4054	2005.79	1.45	1569	2006.1	1.30	2485	2005.6	1.49	(0.000)
OccupancyRate	2664	0.88	0.20	622	0.77	0.33	2042	0.91	0.13	(0.000)
YearBuilt	3935	1980.19	22.85	1505	1973.2	26.22	2430	1984.5	19.25	(0.000)
PricePerSF	3558	181.27	246.6	1414	193.42	311.53	2144	173.25	191.8	(0.017)
NumBuilding	1863	4.76	9.09	752	4.14	8.06	1111	5.18	9.71	(0.015)
Apartment	4054	0.24	0.43	1569	0.29	0.46	2485	0.21	0.40	(0.000)
Hotel	4054	0.11	0.31	1569	0.15	0.35	2485	0.09	0.28	(0.000)
Industrial	4054	0.16	0.36	1569	0.19	0.39	2485	0.14	0.35	(0.000)
Office	4054	0.26	0.44	1569	0.21	0.40	2485	0.30	0.46	(0.000)
Retail	4054	0.23	0.42	1569	0.17	0.37	2485	0.27	0.44	(0.000)
CBD	4054	0.10	0.31	1569	0.14	0.34	2485	0.08	0.28	(0.000)
StatesLong	4054	0.21	0.41	1569	0.24	0.43	2485	0.20	0.40	(0.001)
Region-East	4054	0.13	0.34	1569	0.08	0.27	2485	0.17	0.37	(0.000)
Region-South	4054	0.45	0.50	1569	0.37	0.48	2485	0.49	0.50	(0.000)
Region-Midwest	4054	0.14	0.34	1569	0.12	0.32	2485	0.15	0.36	(0.004)
Region-West	4054	0.29	0.45	1569	0.44	0.50	2485	0.19	0.39	(0.000)
MarketIndex-Apartment	4054	0.07	0.05	1569	0.07	0.05	2485	0.07	0.05	(0.058)
MarketIndex-Hotel	4054	0.03	0.05	1569	0.03	0.05	2485	0.03	0.05	(0.027)
MarketIndex-Industrial	4054	0.04	0.04	1569	0.04	0.04	2485	0.04	0.04	(0.010)

Table 4 (continued)

Variable	All distressed loans			Portfolio loans			Securitized loans			Difference-in-mean test
	N	Mean	Std	*N*	Mean	Std	*N*	Mean	Std	
MarketIndex-Office	4054	0.04	0.04	1569	0.04	0.05	2485	0.04	0.04	(0.034)
MarketIndex-Retail	4054	0.07	0.04	1569	0.06	0.04	2485	0.07	0.04	(0.006)

This table presents the summary statistics of dependent and independent variables used in the regression analyses. The complete description of variables is provided in Table 1. The p-values of difference-in-mean test statistics are reported in parentheses

process, 67 % vs. 80 %. The average recovery rate of securitized loans is higher than those of portfolio loans, however the univariate statistic is not significant.

Empirical Analysis

Our goal is to investigate the role of securitization in the financial resolution of distressed commercial mortgages. First, we examine the impact of securitization on the likelihood of a distressed property or loan being resolved and resolution outcome. In particular, we focus on whether the lending type (i.e., portfolio lending versus securitization) impacts the likelihood of a distressed loan being foreclosed on versus restructured. We further examine whether and by what means securitization affects the time to resolution and capital recovery rate. We discuss the empirical analyses and results in this section.

Distress and Financial Resolution

Resolution Across Lending Types and Test Windows

We begin the analysis by examining the resolution outcomes of distressed loans by time elapsed since they became troubled and compare between portfolio and securitized loans. Table 5 presents summary statistics or the percentage of distressed loans in each type of resolution outcome across different distress horizons.

Table 5 Panel A shows that for our commercial mortgage sample, across all four time windows, liquidation or foreclosure is the most likely resolution outcome. Within the first 6 months of becoming troubled about 23.9 % of distressed loans are liquidated, with 22 % being foreclosed upon and 1.9 % being disposed via other non-foreclosure sales. The liquidation and foreclosure rate decrease significantly, more than half, within the 9 months (9.1 % and 7.4 %) and 12 months (8.4 % and 7.2 %) of default. Restructure takes place in about 1.3 % of all cases within 6 months and remains low at about 1.5 % within 9 months and 12 months. Compared to previous literature based on residential mortgage data (e.g. Agarwal et al., 2011), this restructure rate is particularly low. One possible reason is that we classify restructure as restructure completed. A property with failed restructure or renegotiation remains unresolved in our sample. An interesting fact is that the percentage of distressed loans with no resolution is lowest within 6 months of becoming troubled, suggesting that distressed loans are more likely to be resolved within the first 6 months of becoming troubled.

Table 5 Financial resolution within a given timeframe

	Resolution within a given time frame (in %)			
	6 months (1)	9 months (2)	12 months (3)	18 months (4)
Panel A. All distressed loans				
Restructure	1.3	1.5	1.5	2.3
Liquidation	23.9	9.1	8.4	13.6
- Foreclosure	22.0	7.4	7.2	11.2
- Non-foreclosure	1.9	1.7	1.3	2.4
No resolution	74.8	89.4	90.0	84.1
# of distressed loans	4054	3034	2711	2441
Panel B. Securitized distressed loans				
Restructure	1.4	1.9	2.0	2.9
Liquidation	13.9	6.4	7.9	12.7
- Foreclosure	12.8	5.2	6.4	10.5
- Non-foreclosure	1.1	1.2	1.6	2.1
No resolution	84.7	91.7	90.1	84.4
# of distressed loans	2485	2104	1929	1738
Panel C. Distressed loans held in portfolio				
Restructure	1.0	0.6	0.4	0.9
Liquidation	39.7	15.3	9.7	15.9
- Foreclosure	36.6	12.5	9.1	12.9
- Non-foreclosure	3.1	2.8	0.6	3.0
No resolution	59.3	84.1	89.9	83.2
# of distressed loans	1569	930	782	703

This table presents the resolution outcome of distressed commercial mortgages in a given time frame, specifically, within 6, 9, 12 and 18 months from loans becoming troubled. The sample tracks the resolution of commercial real estate loans from 2008 Q1 to 2012 Q3. All distressed loans are current at the end of 2007 and become troubled beginning with the first quarter of 2008. There is no restriction on the date of origination. Restructure includes loan refinancing, loan modification, extension. Foreclosure includes lender REO, trustee sale and foreclosure post-sale. Non-foreclosure liquidation includes short sale, receivership sale or other types of disposition. No resolution refers to those loans that are remained distressed at the end of a given time frame. Panel A presents resolution outcomes of all distressed loans within 6, 9, 12, 18 months since becoming troubled. Panel B presents resolution outcomes of distressed securitized loans versus distressed portfolio loans

Table 5 Panel B and Panel C show the statistics across portfolio and securitized loans. Comparing securitized loans and portfolio loans, the likelihood of liquidation and foreclosure is significantly higher and the likelihood of restructure is lower for portfolio loans across all time frames. For portfolio loans, it appears that the restructure rate is highest within 6 months (1.0 %) and lowest within 12 months (0.4 %). In contract, for securitized loans, the restructure rate is lowest within 6 months (1.4 %) and increases to 2.9 % within 18 months. The results suggest that it takes a shorter time for a portfolio lender to complete a restructure. As pointed out by previous literature in distressed debt workout that negotiation appears to be easier when the debt is privately placed and owned by fewer lenders in the workout of distressed loans, it may be easier

to negotiate with a portfolio lender and requires less time to reach an agreement. The percentage of "no resolution" is lowest for portfolio loans across all time frames suggesting that portfolio loans are more likely to be resolved. If a portfolio lender is viewed as the sole decision maker in a distress scenario, then portfolio lenders may take a more active approach to resolve distress.

Securitization and Likelihood of a Distressed Loan Being Resolved

In this section, we examine the impact of securitization on the likelihood of a distressed loan being resolved. We employ a Probit approach. The basic model setup is as follows:

$$\Pr(\mathrm{R}_i|\mathrm{distressed})_i = \Phi\left(\alpha + \beta \times \mathrm{PortfolioLoan}_i + \gamma \times \mathrm{controlvariables}_i + \varepsilon_i\right) \quad (1)$$

The dependent variable, R_i, is an indicator variable, which equals one if a distressed loan i is resolved, as being liquidated or restructured. The explanatory variable of interest is $\mathrm{PortfolioLoan_i}$, which is a dichotomous variable to indicate whether a commercial loan is held in a portfolio. The coefficient β would measure the marginal impact on the financial resolution of distressed loans in the commercial real estate market. We include a set of control variables to control for loan and property characteristics, location and market condition. We also include a fixed effect for loan origination year.

Importantly, loans that are selected to be securitized could be systematically different from those held in the portfolio, which creates a nonrandom sample. To control for such sample selection bias, following Ambrose, Capone and Deng (2001) and Cheng and Deng (2013), we employ the Heckman 2-stage approach. To perform the first stage analysis of the Heckman approach, we expand the sample to include both performing and distressed commercial loans. We obtain the data of loan and property characteristics at origination from RCA. We retain all loans with no missing data and originated since 1996 to match the earliest origination year in the distressed sample.

Using the final sample of 27,472 commercial loans, we run a Probit model to examine the determinants of commercial loans selected to be securitized. Specifically, we regress a securitization indicator on a set of loan and property characteristics at origination, and estimate the inverse Mills ratio.[10] The results of the first stage regression are reported in the Appendix, Table A.1. We find a lower incidence of securitization on larger loans, which is consistent with Ghent and Valkanov (2013). We also find evidence that banks are less likely to secure loans than nonbanks, a finding consistent with Gonas, Highfield and Mullineaux (2004). In addition, the result shows that commercial loans used for property acquisition and construction/land purchase are less likely to be securitized. In the second stage, we include the inverse Mills ratio from the first-stage model as an additional explanatory variable. Heckman (1976) shows that including the inverse Mills ratio in the second-stage estimation corrects the sample selection bias and provides more consistent estimates of the parameters.

[10] The inverse Mills ratio is defined as $f(x'\beta)/F(x'\beta)$ if a loan is securitized and $-f(-x'\beta)/F(-x'\beta)$ if a loan is not securitized, where f is the probability density function and F is the cumulative density function. The x represents the matrix of data points and β is the vector of coefficients from the first stage Probit regression.

Table 6 Determinants of resolution likelihood

	All	within 6 months	within 9 months	within 12 months	within 18 months
	(1)	(2)	(3)	(5)	(6)
PortfolioLoan	0.55***	1.12***	0.70***	0.14	0.29*
	(0.09)	(0.09)	(0.14)	(0.17)	(0.16)
LTV	−0.02	−0.01	−0.01	0.001	0.04
	(0.04)	(0.03)	(0.05)	(0.05)	(0.04)
DistressedSize	0.1***	−0.03	0.11***	0.05	0.1***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
LoanAge	−0.02***	0.01***	0.01***	0.001	−0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FixedLoan	0.19***	0.14*	0.03	0.05	0.31**
	(0.07)	(0.07)	(0.11)	(0.13)	(0.13)
TermLong	0.12	0.08	0.03	−0.1	0.23
	(0.29)	(0.27)	(0.43)	(0.51)	(0.44)
CBD	0.07	0.001	0.10	−0.09	0.03
	(0.08)	(0.08)	(0.11)	(0.13)	(0.11)
StatesLong	−0.3***	−0.34***	−0.33***	−0.16*	−0.08
	(0.06)	(0.06)	(0.09)	(0.09)	(0.08)
Region-East	0.16**	0.38***	0.06	−0.01	−0.18
	(0.08)	(0.09)	(0.11)	(0.12)	(0.12)
Region-South	0.16***	0.42***	−0.03	0.04	−0.08
	(0.06)	(0.06)	(0.08)	(0.09)	(0.08)
Region-Midwest	−0.26***	−0.18*	−0.13	−0.19	−0.25**
	(0.07)	(0.09)	(0.11)	(0.12)	(0.11)
Apartment	0.2***	0.04	0.32***	0.08	−0.05
	(0.06)	(0.07)	(0.1)	(0.1)	(0.09)
Hotel	−0.06	−0.13	0.09	−0.01	0.09
	(0.08)	(0.09)	(0.13)	(0.13)	(0.11)
Industrial	−0.07	−0.22***	0.16	0.08	0.001
	(0.07)	(0.08)	(0.11)	(0.11)	(0.1)
Retail	−0.1	−0.03	0.12	−0.08	−0.14
	(0.06)	(0.07)	(0.1)	(0.1)	(0.1)
MarketIndex	−5.15***	−3.46***	−2.9***	−3.2***	−1.39*
	(0.56)	(0.51)	(0.71)	(0.72)	(0.71)
Inverse Mills Ratio	−0.05*	−0.04	−0.08*	−0.02	−0.04
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)
Constant	0.87**	−0.88**	−3.71***	−1.78***	−1.16**
	(0.39)	(0.40)	(0.58)	(0.61)	(0.57)
Origination Year FE	Yes	Yes	Yes	Yes	Yes
N	4054	4054	3034	2711	2441

Table 6 (continued)

	All	within 6 months	within 9 months	within 12 months	within 18 months
	(1)	(2)	(3)	(5)	(6)
Pseudo R2	0.11	0.12	0.07	0.02	0.05
Likelihood Ratio	577.17	537.66	137.09	42.94	104.84

This table presents the maximum-likelihood parameter estimates from Probit regressions of resolution likelihood on the portfolio lending indicator variable, loan and property characteristics, location variables and housing market condition. The sample tracks the resolution of distressed commercial mortgages from 2008 Q1 to 2012 Q3. All distressed loans are current at the end of 2007 and become troubled beginning with the first quarter of 2008. The dependent variable equals 1 if the distressed loan is "Resolved" either through restructure or liquidation during the sample period and within 6, 9, 12 and 18 months from the start of distressed cycle. The complete description of variables is provided in Table 2. The inverse Mills ratio is calculated using the Heckman 2-stage model to correct for sample selection bias. In the first stage, we regress a securitization indicator in a sample of commercial loans, including both securitized and portfolio loans, on loan and property characteristics at the time of origination. The standard errors (S.E.) of the estimates are reported in parentheses. ***, ** and * denote the statistical significance of Wald test statistics at 1 %, 5 % and 10 % levels

Table 6 reports the results with the Heckman 2-stage model. The portfolio lending indicator coefficient is positive and significant at the 1 % level. This result supports Hypothesis 1, stating that compared to securitized loans, portfolio loans are more likely to be resolved. We further run regressions across different time windows, namely, within 6, 9, 12 and 18 months of a loan becoming distressed. As shown in columns (2)-(6), the portfolio lending indicator coefficient is positive and significant at the 1 % level in the time windows of within 6, 9 and 18 months. There is no significant difference in resolution between distressed securitized and portfolio loans in the windows of within 12 months. Our results suggest that compared to securitized loans, distressed portfolio loans are more likely to be resolved and, more importantly, they are more likely to be resolved within 6, 9 and 18 months from becoming troubled. Again, this result supports Hypothesis 1. Using a different sample of commercial mortgage loans, Ghent and Valkanov (2013) also finds that securitized loans are less likely to be resolved.

Table 6 also shows that fixed-rate loans and loans with a higher unpaid balance are more likely to be resolved. More seasoned or older loans and loans secured with properties located in states with a long foreclosure process are less likely to be resolved. Loans secured with properties located in the East and South regions are more likely to be resolved and loans associated with properties located in the Midwest regions are less likely to be resolved.

Resolution Outcome

We further examine the impact of portfolio loans versus securitization on resolution outcome, or how a distressed loan is resolved. Specifically, we examine the relationship between securitization and three types of resolution outcome, namely, liquidation, foreclosure and Lender REO. We employ a Probit model as shown in equation (1). The dependent variable, R_i, is employed in three cases as a variable to indicate resolution outcome. It equals one for the three cases where a distressed loan i is liquidated, foreclosed or Lender REO.

Table 7 Determinants of resolution outcome

	Liquidation			Foreclosure			LenderREO		
	All (1)	within 6 months (2)	within 9 months (3)	All (4)	within 6 months (5)	within 9 months (6)	All (7)	within 6 months (8)	within 9 months (9)
PortfolioLoan	0.74***	1.2***	0.8***	0.56***	1.18***	0.58***	0.41***	0.95***	0.65***
	(0.09)	(0.09)	(0.14)	(0.09)	(0.09)	(0.15)	(0.09)	(0.1)	(0.17)
LTV	0.03	0.01	0.03	0.01	0.001	0.02	0.06*	0.02	0.05
	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.03)	(0.04)	(0.05)
DistressedSize	−0.03	−0.07***	0.02	−0.02	−0.08***	0.03	−0.03	−0.11***	0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.04)	(0.02)	(0.03)	(0.04)
LoanAge	−0.02***	0.001***	0.001**	−0.01***	0.01***	0.001	−0.01***	0.001	0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FixedLoan	0.2***	0.16**	0.13	0.15**	0.13*	0.1	0.11	0.08	0.25*
	(0.07)	(0.07)	(0.11)	(0.07)	(0.07)	(0.12)	(0.07)	(0.08)	(0.13)
TermLong	0.19	0.1	0.09	−0.3	−0.19	−0.2	−0.54*	−0.4	−3.56
	(0.28)	(0.27)	(0.43)	(0.27)	(0.28)	(0.53)	(0.29)	(0.3)	(104.75
CBD	−0.06	−0.1	0.07	−0.13*	−0.15*	0.13	−0.37***	−0.31***	0.06
	(0.07)	(0.08)	(0.11)	(0.07)	(0.09)	(0.12)	(0.08)	(0.1)	(0.14)
StatesLong	−0.24***	−0.35***	−0.25***	−0.21***	−0.35***	−0.24**	−0.34***	−0.37***	−0.3**
	(0.06)	(0.07)	(0.1)	(0.05)	(0.07)	(0.1)	(0.06)	(0.07)	(0.12)
Region-East	0.07	0.39***	−0.02	−0.05	0.33***	−0.14	−0.15*	0.27***	−0.63***
	(0.08)	(0.09)	(0.12)	(0.08)	(0.09)	(0.13)	(0.08)	(0.1)	(0.19)
Region-South	0.17***	0.44***	−0.06	0.19***	0.49***	−0.07	0.18***	0.45***	−0.06
	(0.05)	(0.06)	(0.09)	(0.05)	(0.06)	(0.09)	(0.05)	(0.06)	(0.1)
Region-Midwest	−0.29***	−0.16*	−0.27**	−0.23***	−0.11	−0.29**	−0.18**	−0.12	−0.32**
	(0.07)	(0.09)	(0.12)	(0.07)	(0.09)	(0.13)	(0.08)	(0.1)	(0.14)
Apartment	0.24***	0.04	0.37***	0.13**	0.03	0.17	−0.06	−0.04	−0.07
	(0.06)	(0.07)	(0.1)	(0.06)	(0.07)	(0.11)	(0.06)	(0.07)	(0.12)

Table 7 (continued)

	Liquidation			Foreclosure			LenderREO		
	All	within 6 months	within 9 months	All	within 6 months	within 9 months	All	within 6 months	within 9 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Hotel	0.06	−0.14	0.05	0.06	−0.17*	−0.04	0.22***	−0.13	0.001
	(0.08)	(0.09)	(0.13)	(0.08)	(0.09)	(0.14)	(0.08)	(0.1)	(0.15)
Industrial	−0.04	−0.24***	0.11	0.02	−0.22***	0.1	0.13*	−0.15*	0.14
	(0.07)	(0.08)	(0.12)	(0.07)	(0.08)	(0.12)	(0.07)	(0.08)	(0.13)
Retail	0.04	−0.02	0.17	0.07	0.02	0.16	0.16***	0.1	0.21*
	(0.06)	(0.07)	(0.11)	(0.06)	(0.07)	(0.11)	(0.06)	(0.07)	(0.12)
MarketIndex	−2.19***	−2.99***	−2.2***	0.77*	−1.49***	−0.2	3.45***	0.23	0.58
	(0.49)	(0.51)	(0.74)	(0.46)	(0.52)	(0.81)	(0.48)	(0.55)	(0.92)
Inverse Mills Ratio	−0.08***	−0.06**	−0.09*	−0.02	−0.06**	−0.01	−0.04	−0.06**	−0.02
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.05)
Constant	2.03***	−0.29	−2.23***	1.17***	−0.41	−2.4***	1.12***	0.41	−2.15***
	(0.38)	(0.41)	(0.6)	(0.37)	(0.42)	(0.63)	(0.38)	(0.43)	(0.72)
Origination Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4054	4054	3034	4054	4054	3034	4054	4054	3034
Pseudo R2	0.09	0.13	0.07	0.06	0.12	0.05	0.06	0.11	0.07
Likelihood Ratio	484.15	565.35	120.61	322.57	514.99	79.99	331.19	369.48	85.31

This table presents the maximum-likelihood parameter estimates from Probit regressions of resolution outcome on the portfolio lending indicator variable, loan and property characteristics, location variables and housing market condition. The sample tracks the resolution of distressed commercial mortgages from 2008 Q1 to 2012 Q3. All distressed loans are current at the end of 2007 and become troubled beginning with the first quarter of 2008. The dependent variable equals 1 if the distressed loan was "Liquidated", "Foreclosed" or became "Lender REO" during the sample period, within 6 or 9 months from the start of distress cycle. The complete description of variables is provided in Table 1. The inverse Mills ratio is calculated using the Heckman 2-stage model to correct for sample selection bias. In the first stage, we regress a securitization indicator in a sample of commercial loans, including both securitized and portfolio loans, on loan and property characteristics at the time of origination. The standard errors (S.E.) of the estimates are reported in parentheses. ***, ** and * denote the statistical significance of Wald test statistics at 1 %, 5 % and 10 % levels

The empirical results are presented in Table 7. In the analysis, we run Probit regression across the entire sample period and within two time frames, 6 month into distress and 9 month into distress. We focus on these two time windows because there is no significant difference in how portfolio loans and securitized loans are resolved in the time windows of within 12 and 18 months, as previously discussed. Table 7 Columns (1) to (3) show the results of the determinants of liquidation. Columns (4) to (6) show the results of the determinants of foreclosure. Columns (7) to (9) show the results of the determinants of lender REO. All models show that the coefficient on the portfolio loan variable is significantly positive at the 1 % level, which suggests that portfolio loans (securitized loans) have a significantly greater (less) likelihood of being liquidated or foreclosed and less (more) likely to be restructured. Our finding supports Hypothesis 2A and is consistent with Adelino et al. (2013b), which employs the early-payment default analysis to examine the causal effect of securitization on the incidence of residential mortgage modification. They find that securitized mortgages are less likely to be foreclosed on by servicers.

Our results are contradictory to a few other studies based on the residential mortgage market, e.g. Agarwal et al. (2011) and Piskorski et al. (2010). They find that foreclosures are less likely to take place for portfolio loans than securitized loans which were sold to investors. One reason is that our paper focuses on the final resolution outcome. The servicers may change strategy during the workout process. For example, a portfolio lender may initially choose to restructure the distressed loan and decide to foreclose on the property after an unsuccessful renegotiation with the borrower. In such a situation, our study documents the resolution outcome as foreclosure. Another reason is that we focus on the private or non-agency securitization market, where the loans are securitized by private institutions while other studies include GSE loans in the sample. GSEs generally provide explicit guidance for how servicers should deal with distressed loans. The workout process with the involvement of GSEs could be different. More importantly, differences in empirical results may suggest that default management and the workout process are handled differently in the commercial real estate market compared to the residential real estate market. Residential mortgages and commercial mortgages have substantially different characteristics, which may provide different incentives to servicers. For example, residential properties are generally smaller and have a higher percentage located in the niche, small markets. The highest valued user might be the existing owner. In contrast, commercial properties are mostly large and generic. Its value may be easily transferred form one investor to another. Hence, servicers might have incentives to restructure distressed residential mortgages and to foreclose on distressed commercial mortgages. Portfolio lender may also face pressure from the regulators not to foreclose on residential mortgages.

The results in Table 7 also show that distressed loans with more seasoning (i.e., longer time from origination) and associated with properties located in states with a longer foreclosure process are less likely to be liquidated or foreclosed. Distressed loans with fixed rates are more likely to be liquidated or foreclosed. In terms of property type, distressed loans secured by apartment properties are more likely to be liquidated or foreclosed. Distressed loans associated with properties located in the East and South

regions are more likely to be liquidated or foreclosed on while distressed loans associated with properties located in the Midwest region are less likely to be liquidated or foreclosed. In addition, the likelihood of foreclosure is lower when the market is better.

Time to Resolution

Following the results reported in Table 5, we further investigate the impact of securitization on the length of time from a loan becoming distressed to being resolved. Because some loans were not resolved before the study was terminated, we must use a method that allows for censored data. The Cox proportional hazard model is a well-recognized statistical technique developed in medical science to study censored data in the field of survival analysis. This method has been applied in mortgage default studies to model time to default (e.g. Chen and Deng 2013 Ciochetti, Deng, Lee, Shilling and Yao 2003). It has advantages over multinomial logit models in the survival analysis by relaxing assumptions about the specific error term distribution and incorporating the time-varying decision making process. Hence, we employ the Cox proportional hazard model to analyze distressed loans' time to resolution. Specifically, in the Cox hazard model, we examine the effect of securitization on the conditional probability that a distressed loan will be resolved at a particular time, given that it remains in the distressed status up to that period (i.e., hazard rate).[11]

The results for the Cox hazard model estimation are shown in Table 8. We examine the effects of securitization on both time to resolution (in the first two columns) and time to foreclosure (in the final two columns). As previously discussed, Time to Resolution is measured as the number of months from a loan becoming distressed to final resolution, either as being restructured or liquidated. Time to Foreclosure is measured as the number of months from a loan becoming distressed to foreclosure. In addition, we not only use the full sample reported in Columns (1) and (3), we also use a sub-sample constructed by including only the distressed loans with the distress event being delinquent/default. Using this sub-sample allows us to standardize the distress cycle starting point. The sub-sample results are reported in Columns (2) and (4).

Table 8 shows that in all four columns, the portfolio loan indicator coefficients are positive and significant at the 1 % level, which indicates that portfolio loans have higher hazard rates, i.e., higher conditional probability of being resolved in the next period given that loans remain distressed at time t. The results show that portfolio loans

[11] In our analysis, the hazard function is defined as the probability density of a loan being resolved at time t, conditional on its being in the distressed status before time t: $\lambda(t) = \lim_{\Delta t \to 0} \frac{\Pr(t < T < t+\Delta t | T \geq t)}{\Delta t} = \frac{f(t)}{1-F(t)}$, where $f(t)$ is the probability density function of the time duration for the loan to become resolved at t and $F(t)$ is the cumulative density function. The Cox hazard model of analyzing the effects of a set of covariates or explanatory variables on the hazard rate can be specified as $\lambda(t)=\exp(x'\beta)\lambda_0(t)$, where β is the vector of unknown regression coefficients, x is the vector of covariates, and $\lambda_0(t)$ is the baseline hazard function revealing the pattern of hazard rates over time for the average distressed loan in the sample. The Cox's partial likelihood function is then applied to estimate the regression parameters. Further details of the Cox hazard model are specified in Cox and Oakes (1984). We thank an anonymous referee for this helpful suggestion on applying the Cox hazard model to analyze time to resolution.

Table 8 Time to resolution

	Time to Resolution		Time to Foreclosure	
	(1) All distressed events	(2) Delinquent/Default	(3) All distressed events	(4) Delinquent/Default
PortfolioLoan	0.42***	0.48***	0.60***	0.65***
	(0.08)	(0.11)	(0.09)	(0.12)
LTV	−0.03	−0.03	0.001	0.0011
	(0.03)	(0.04)	(0.03)	(0.04)
DistressedSize	0.07***	0.05*	0.001	0.01
	(0.02)	(0.03)	(0.02)	(0.03)
LoanAge	0.02***	0.02***	0.01***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)
FixedLoan	0.29***	0.4***	0.3***	0.43***
	(0.07)	(0.09)	(0.07)	(0.09)
TermLong	0.18	−0.12	0.06	−0.14
	(0.25)	(0.38)	(0.28)	(0.41)
CBD	−0.01	−0.02	−0.18**	−0.14
	(0.07)	(0.09)	(0.08)	(0.11)
StatesLong	−0.3***	−0.27***	−0.32***	−0.38***
	(0.06)	(0.08)	(0.06)	(0.09)
Region-East	0.08	−0.55***	−0.05	−0.7***
	(0.07)	(0.11)	(0.09)	(0.13)
Region-South	0.17***	−0.29***	0.26***	−0.17**
	(0.05)	(0.07)	(0.06)	(0.07)
Region-Midwest	−0.23***	−0.54***	−0.21**	−0.46***
	(0.08)	(0.10)	(0.09)	(0.11)
Apartment	−0.01	−0.06	−0.03	−0.14
	(0.06)	(0.08)	(0.07)	(0.09)
Hotel	0.68***	0.62***	0.66***	0.52***
	(0.08)	(0.1)	(0.09)	(0.12)
Industrial	0.43***	0.3***	0.44***	0.33***
	(0.07)	(0.09)	(0.08)	(0.10)
Retail	0.47***	0.47***	0.52***	0.53***
	(0.06)	(0.08)	(0.07)	(0.09)
MarketIndex	8.73***	8.82***	10.4***	10.39***
	(0.48)	(0.65)	(0.57)	(0.74)
Inverse Mills Ratio	0.07***	0.09***	0.05*	0.06*
	(0.02)	(0.03)	(0.03)	(0.03)
N	2523	1415	1981	1169
Pseudo R2	0.18	0.14	0.17	0.13
Likelihood Ratio	794.18	595.39	741.88	568.88

This table reports the results of a Cox hazard model analysis of time to resolution/foreclosure on a portfolio lending indicator variable, loan and property characteristics location variables and housing market condition. The sample tracks the resolution of distressed commercial mortgages from 2008 Q1 to 2012 Q3. All distressed loans are current at the end of 2007 and become troubled beginning with the first quarter of 2008. Time to Resolution is calculated as the number of months from the loan becoming troubled to final resolution, either through restructure or liquidation. Time to Foreclosure is calculated as the number of months from the loan becoming troubled to foreclosure completion. A commercial mortgage or property is categorized as troubled if it experiences one of the distressed events, including being in delinquency/default, being transferred to special servicer, foreclosure initiated, maturity default and borrowers being in bankruptcy. We also calculate the time to resolution/foreclosure using a strict definition of distressed status, as number of months from the loan being in delinquent/default to being resolved or foreclosed. The complete description of variables is provided in Table 1. The Inverse Mills ratio is calculated using the Heckman 2-stage model to correct for sample selection bias. In the first stage, we regress a securitization indicator in a sample of commercial loans, including both securitized and portfolio loans, on loan and property characteristics at the time of origination. The standard errors (S.E.) of the estimates are reported in parentheses. ***, ** and * denote the statistical significance of Chi-square test statistics at 1 %, 5 % and 10 % levels

experience shorter time to resolution and shorter time to foreclosure, which supports our Hypothesis 3. Portfolio lenders appear to have more incentives to shorten time to resolution and be more efficient in resolving distressed mortgages. Our results suggest that special servicers may not be correctly incentivized and tend to prolong the workout process. As previously discussed, several factors may cause a longer resolution period for securitized loans, including the multi-tranche structure of CMBS and special servicers' compensation structure.

Table 8 also shows that more seasoned loans, loans with larger distressed size and fixed-rate loans have shorter time to resolution. Loans associated with properties located in states with strict foreclosure laws have significantly longer time to resolution. Loans associated with properties located in the South regions have shorter time to resolution while loans associated with properties located in the Midwest regions have longer time to resolution.

Capital Recovery Rate

In this section, we examine the relationship between lending type (portfolio lending vs. securitization) and capital recovery rate. Capital recovery rate is measured as the resolved transaction amount or gross proceeds from the disposition divided by the total outstanding balance of the first mortgage loan at the time of default. We first compare the recovery rate of portfolio loans and securitized loans within different time windows. Table 9 presents the recovery rate of distressed loans liquidated or foreclosed within 6, 9, 12 and 18 months from becoming troubled. The results show that the foreclosure recovery rate is lower than non-foreclosure recovery rate. Across all time frames, the recovery rates of the loans that are liquidated within 9 and 12 months are higher than those resolved within 6 and 18 months. Compared to securitized loans, portfolio loans have higher capital recovery rates when they are resolved within 6 months from becoming troubled. The results suggest that the recovery rate has a non-linear relationship with the length of time to resolution.

We further run the Tobit regression to examine the relationship between portfolio lending and recovery rate for all liquidated distressed loans (i.e., loans that are disposed either through foreclosure or non-foreclosure process, such as short-sell). We consider additional regression with the dependent variable to indicate that the distressed loans are liquidated within 6 months from becoming troubled. The results are reported in Table 10. Column (1) shows that the portfolio lending indicator coefficient is not significant when we use the full sample. However, when we consider liquidation within 6 months from becoming troubled, the portfolio lending indicator coefficient is significantly positive, as shown in Column (2). The results suggest that conditional on the loan being liquidated or foreclosed on within 6 months of the distressed cycle – a relatively swift resolution – portfolio loans have higher recovery rate than securitized loans.

We also differentiate between liquidation types and run additional regressions to investigate the impact of securitization on the recovery rates of distressed loans that are resolved through foreclosure and those that are resolved through non-foreclosure liquidations. Table 10 shows that portfolio loans have higher recovery rate when they are foreclosed on within 6 months from becoming troubled. We do not find significant

Table 9 Capital recovery rates across time frames

	Recovery rate within a given time frame (in %)			
	6 months (1)	9 months (2)	12 months (3)	18 months (4)
Panel A. All distressed loans				
Liquidation	67.9	70.9	73.4	66.9
- Foreclosure	66.1	68.1	72.0	61.4
- Non-foreclosure	81.5	78.5	78.1	83.9
Panel B. Securitized distressed loans				
Liquidation	63.8	75.6	71.3	68.7
- Foreclosure	60.8	73.2	67.3	65.3
- Non-foreclosure	84.3	81.2	78.7	79.0
Panel C. Distressed loans held in portfolio				
Liquidation	69.8	67.2	76.5	64.0
- Foreclosure	68.6	64.5	76.7	55.2
- Non-foreclosure	80.0	75.9	74.2	92.6

This table reports the capital recovery rates of distressed loans that are liquidated within a given time frame. The sample tracks the resolution of distressed commercial mortgages from 2008 Q1 to 2012 Q3. All distressed loans are current at the end of 2007 and become troubled beginning with the first quarter of 2008. Recovery Rate is the ratio of resolved proceeds, or gross proceeds from the disposition through liquidation, over total outstanding balance of the first mortgage loan at the time of default. Besides total unpaid balance, total distressed costs might include accrued interest, property maintenance costs, foreclosure expenses etc. Hence, the recovery rate can be above one. The complete description of variables is provided in Table 1

relationship between portfolio lending and recovery rate of distressed loans that are resolved through non-foreclosure liquidations.

The combined empirical results in Table 8 and Table 10 show that portfolio loans are resolved more quickly and have higher recovery rates during the liquidation/foreclosure process when they are resolved swiftly. This suggests that portfolio lenders might be more efficient in working out distressed loans in the commercial mortgage market.

For the control variables, we find that the loans with higher LTV, larger distressed size, associated with properties located in South and Midwest regions have lower recovery rate. More seasoned loans, loans associated with properties located in the central business district have higher recovery rate. Loans secured by apartment building, hotel and industrial building have higher recovery rate.

Robustness Checks

We conduct several robustness tests for the resolution outcome of Foreclosure.[12] First, we exclude the loans where the distress event is transfer to a special servicer since this trigger only applies to securitized loans. We find that the portfolio loan indicator

[12] These results are available upon request. The table has been removed for space considerations.

Table 10 Capital recovery rates–Tobit regression

	Recovery rate					
	Liquidation		Foreclosure		Non-foreclosure	
	(1) All	(2) Within 6 months	(4) All	(5) Within 6 months	(7) All	(8) Within 6 months
Portfolio loan	0.001	0.59***	−0.01	0.56***	0.05	0.38
	(0.03)	(0.07)	(0.03)	(0.07)	(0.07)	(0.32)
LTV	−0.04***	−0.03	−0.06***	−0.05	0.001	−0.03
	(0.01)	(0.03)	(0.01)	(0.04)	(0.02)	(0.08)
Distressed size	−0.01	−0.04*	−0.01	−0.05**	−0.01	0.1
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.09)
LoanAge	0.001***	0.02***	0.001***	0.02***	0.001	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FixedLoan	0.001	0.05	−0.03	0.01	0.07	0.24
	(0.02)	(0.06)	(0.02)	(0.06)	(0.06)	(0.25)
TermLong	0.1	0.3	0.001	−0.03	0.04	1.66**
	(0.07)	(0.2)	(0.08)	(0.22)	(0.18)	(0.68)
CBD	0.1***	−0.04	0.08***	−0.07	0.11**	0.17
	(0.02)	(0.07)	(0.03)	(0.07)	(0.05)	(0.22)
StatesLong	0.02	−0.23***	0.02	−0.23***	0.08	−0.1
	(0.02)	(0.06)	(0.02)	(0.06)	(0.05)	(0.23)
Region-East	−0.01	0.16**	−0.01	0.17**	−0.09	0.11
	(0.03)	(0.08)	(0.03)	(0.08)	(0.06)	(0.25)
Region-South	−0.08***	0.13**	−0.06***	0.14***	−0.17***	−0.15
	(0.02)	(0.05)	(0.02)	(0.05)	(0.05)	(0.22)
Region-Midwest	−0.05*	0.01	−0.04	0.06	−0.08	−0.42
	(0.03)	(0.09)	(0.03)	(0.08)	(0.07)	(0.35)
Apartment	0.14***	0.04	0.15***	0.07	0.08	−0.16
	(0.02)	(0.06)	(0.02)	(0.06)	(0.06)	(0.27)
Hotel	0.08***	−0.04	0.07**	−0.03	0.07	−0.08
	(0.03)	(0.08)	(0.03)	(0.08)	(0.07)	(0.3)
Industrial	0.09***	−0.1	0.1***	−0.1	0.06	−0.08
	(0.03)	(0.08)	(0.03)	(0.07)	(0.07)	(0.31)
Retail	0.02	−0.06	0.04*	−0.03	−0.07	−0.29
	(0.02)	(0.06)	(0.02)	(0.06)	(0.06)	(0.28)
MarketIndex	−0.25*	−2.6***	−0.03	−2.22***	−0.54	−8.71***
	(0.15)	(0.45)	(0.16)	(0.46)	(0.36)	(1.76)
Inverse mills ratio	−0.02**	−0.02	−0.01	−0.04**	−0.03	0.28***
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.1)

Table 10 (continued)

	Recovery rate					
	Liquidation		Foreclosure		Non-foreclosure	
	(1) All	(2) Within 6 months	(4) All	(5) Within 6 months	(7) All	(8) Within 6 months
Constant	0.72***	−0.77**	0.63***	−0.58	1.06***	−3.59**
	(0.12)	(0.37)	(0.13)	(0.36)	(0.34)	(1.55)
Origination year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1548	1548	1257	1257	291	291
Pseudo R2	0.32	0.11	0.61	0.12	0.24	0.16
Likelihood ratio	161.44	292.01	146.72	273.18	46.28	69.54

This table reports the results of Tobit regressions of recovery rate on a portfolio lending indicator variable, loan and property characteristics, location variables and housing market conditions. The inverse Mills ratio is calculated using the Heckman 2-stage model to correct for sample selection bias. In the first stage, we regress a securitization indicator in a sample of commercial loans, including both securitized and portfolio loans, on loan and property characteristics at the time of origination. The standard errors (S.E.) of the estimates are reported in parentheses. ***, ** and * denote the statistical significance of Wald test statistics at 1 %, 5 % and 10 % levels

coefficient of is positive and significant at the 1 % level, which is consistent with results using the full sample. Second, we use a subsample of portfolio loans held by banks. The results show that loans held in a bank's portfolio are more likely to be foreclosed upon relative to other loans. The higher foreclosure rate on bank-held commercial mortgages suggests that the resolution outcome is less likely to be driven by bank's unwillingness to recognize losses. One reason for higher foreclosure by bank lenders is that banks may have incentives to clean up their balance sheet. Third, we run regressions using the subsamples of distressed loans that became troubled during the crisis period (prior to June 30, 2009) and those that started the distress cycle post crisis. We find no significant relationship between securitization and the likelihood of foreclosure for loans that became distressed during the crisis period. However, we find a significantly positive relationship between portfolio lending and the likelihood of foreclosure holds post crisis. Last, we include additional control variables, namely capitalization rate at origination, debt service coverage ratio at origination, occupancy rate at origination, a dichotomous variable to indicate a property with multiple buildings and, lastly, price per square feet. The portfolio lending indicator coefficient is not significant is this case. We suspect this result is due to the large number of portfolio loans that drop out of the sample as a result of missing observations. While the balance of evidence from the robustness test supports the main conclusions, we acknowledge the limitations and caveats in the data.

Conclusion

This paper seeks to shed new light on whether lending channels or options (i.e., portfolio lending versus securitization) impacts the financial resolution of distressed loans in the commercial real estate market. The empirical analysis utilizes a large and unique data set of distressed commercial mortgages, including both portfolio loans and securitized loans. The data set is constructed based on the recent financial crisis and includes a diverse set of lenders. It tracks the performance and workout process of commercial mortgages that became troubled during the period of 2008 Q1 to 2012 Q3. We show that the commercial real estate market experienced the most severe distress in 2009, with both the number and total outstanding balances of loans that became distressed reaching their peaks. Since that time, the market has recovered substantially. The dataset also provides detailed information on loan and property characteristics. We find that there exist substantial differences between portfolio and securitized loans.

The main hypotheses address the impact of portfolio lending versus securitization on financial resolution of distressed commercial loans, including the likelihood of a distressed loan being resolved and the resolution outcome, with a focus on a distressed loan being foreclosed upon versus being restructured. Our results are statistically and economically significant. We find portfolio loans compared to securitized loans are less likely to be restructured and more likely to be foreclosed upon. We provide new evidence on the impact of securitization on financial resolution in the distressed commercial mortgage market. Compared to previous studies based on residential mortgages, our results are consistent with Adelino et al. (2013b) and in contrast to Agarwal et al. (2011) and Piskorski et al. (2010).

We further investigate the impact of portfolio lending on the length of time from becoming troubled to being resolved. We find that portfolio loans experience shorter time to resolution, about 5–6 months less than the time for a distressed securitized loan to get resolved. We also find that portfolio loans have higher recovery rates when they are liquidated or foreclosed on within 6 months from becoming troubled.

The study contributes to the growing literature on distressed asset resolution and to provide new perspectives on agents at the nexus of real estate and capital market decisions. Our findings suggest that portfolio lenders are more efficient in the workout process. They resolve distressed commercial real estate loans more quickly and at a higher recovery rate. While we do not offer a direct test, our results are also consistent with the claim that special servicers have incentives to prolong the workout process. Such agency issues are worthy of attention in the reemergence of the CMBS market or, so called, CMBS 2.0.

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Appendix

Table A.1 Probit estimation of loan securitization

	Loans are securitized
LoanSize	0.16***
	(0.01)
Lender - Bank	−3.26***
	(0.16)
Purpose of loan - Property Acquisition	−0.64***
	(0.02)
Purpose of loan - Refinance	−0.01
	(0.05)
Purpose of loan - Construction/land	−3.23***
	(0.22)
Intercept	−2.98***
	(0.14)
N	27472
Pseudo R2	0.35
Likelihood Ratio	13200.71

This table reports the results of the first stage regression in the Heckman 2-stage model, which is a Probit regression of a securitization indicator on loan and property characteristics at the time of origination. The sample is a pooled dataset of all commercial loans including both performing and distressed loans originated since 1996. The loan data is from RCA. The dependent variable takes a value of 1 if the commercial loan is securitized and 0 otherwise. LoanSize is calculated as the natural log of loan amount at origination. LenderBank is a binary variable equal to one if the loan was underwritten by a bank. A set of binary variables are included to indicate the purpose of the loan, including property acquisition, refinancing and construction/land. Based on the first stage estimation, the inverse Mills ratio is calculated and included in the second stage as an additional control variable to correct for sample selection bias. The standard errors (S.E.) of the estimates are reported in parentheses. ***, ** and * denote the statistical significance of Wald test statistics at 1 %, 5 % and 10 % levels

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