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 for securitized and portfolio loans. The data set is constructed based on the recent financial crisis and includes U.S. and International agents. The main hypotheses address the marginal impact of portfolio versus securitized loans on resolution outcome, time to resolution and capital recovery rates. Conditional on a loan becoming troubled, we find a significantly higher foreclosure rate associated with loans held in a portfolio, compared to those that are securitized. Furthermore, portfolio loans experience shorter time to resolution and higher recover rates in the foreclosure process. Our study is intended to contribute 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.

Keywords: Commercial real estate, distressed debt, securitization, financial resolution

JEL Classification: D8, G1, R33

1. Introduction

As a consequence of the recent economic and financial crisis, commercial mortgages experienced historically high default and delinquency rates. The overall delinquency 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. They mainly focus on the residential mortgage market and the evidence is inconclusive. Piskorski, Seru, and Vig (2009) and Agarwal, Amromin, Ben-David, Chomsisengphet and Evanoff (2011) find that portfolio-held loans are more likely to be modified and less likely to be foreclosed upon, compared to securitized mortgages. Adelino, Gerardi and Willen (2013) and Foote, Gerardi, Goette and Willen (2009) find no material difference in the rate of renegotiation between portfolio-held and securitized loans and conclude that securitization does not impede renegotiations. Little has been done on commercial mortgages.

In this paper, we make the first attempt to explore the role of securitization in the distressed commercial real estate market. The objective is to provide new perspective on how securitization impacts financial resolution of distressed commercial mortgages. Specially, we examine the impact of securitization on resolution outcome, length of time to resolution and capital recovery rates. We find that portfolio loans are more likely to be foreclosed upon in the commercial real estate market. Furthermore, we find that portfolio loans experience shorter time to resolution and higher recovery rates in the foreclosure process. The paper responds to recent debate and provides new evidence on the role of securitization in the workout of distressed commercial mortgages. The paper also contributes to the literature related to the costs and benefits of securitization.

The rest of the paper is organized as follows: Section 2 reviews the literature and develops hypotheses. Section 3 describes the data and sample. Section 4 presents the empirical methodology and results. Section 5 concludes.

2. Literature Review and Hypotheses

Literature Review

The existing literature on distressed real estate focuses on default behavior and prepayment decisions. 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. 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, 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 the renegotiation rates. They find that the renegotiation rates of securitized mortgages are lower. Adelino, Gerardi and Willen (2013) and Foote, Gerardi, Goette and Willen (2009) use an algorithm to identify renegotiations. Based on their algorithm, they find 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.

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 (2012) 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 Detail

A distressed loan can be resolved through one of the following alternatives: restructure (including loan refinancing, loan modification, and extension), foreclosure (including lender REO, trustee sale, post-foreclosure sale) and non-foreclosure liquidations (including short sale, receivership sale). Figure 1 illustrates the different potential workout choices. The resolution process dynamic is different between portfolio-held loans and securitized loans. Portfolio loans are owned, managed and serviced by the originating lender, mainly a bank or an insurance company. The original lender makes all decisions in the event of delinquency and default.

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 resolution of financial distress: (1) contracting frictions; (2) asymmetric information; (3) agency conflicts. Servicers of portfolio loans and securitized loans in the commercial real estate market may have different incentives to choose one workout strategy versus another. In this section, we develop the hypotheses centering around the impact of securitization on a servicer choosing foreclosure versus restructure when dealing with distressed commercial mortgages.

A widely held view suspects that securitization of mortgages impedes the process of loan restructure or renegotiation. First, there are several institutional reasons. For securitized loans, the PSA governs the servicing and may place restrictions on how workouts should be carried out. 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. Second, with relationship lending, the amount of information asymmetry between a borrower and portfolio lender are reduced. The portfolio lender might possess soft information about the underlying loan and borrower when evaluating loan defaults, which may lead to a smoother negotiation process. Third, in the case of a securitized loan, the special servicer is an agent of the investors. Fiduciary responsibilities to obtain the highest price for investors may incentivize a special servicer to

manage the foreclosure process and take ownership of the property. The lender-owned property will then be put through an auction process to elicit a fair price, whereby the fiduciary can show they have met their responsibility. This leads to the first of two alternative hypotheses. In each case, the null hypothesis is no marginal effect.

Hypothesis 1A: Compared to securitized loans, portfolio-held loans are more likely to be restructured and less likely to be foreclosed upon.

However, there are reasons to expect that portfolio-held loans are more likely to be foreclosed. First, the potential loss of a commercial mortgage re-default could be higher. Hence, servicers may choose to foreclose a distressed loan ex-ante to minimize the cost. Second, Adelino et al. (2013) present an array of institutional evidence against foreclosure, including the fact that lender's own filings with the SEC show that foreclosures reduce the value of special servicing rights whereas modifications increase them. Third, the information asymmetry is higher when dealing with commercial mortgages. The borrower may know more about underlying property value and profitability. Portfolio lenders may incur losses if they choose to restructure or modify a distressed loan which has a probability of curing. Hence, they may choose to foreclose properties with higher information asymmetry and restructure those with lower information asymmetry.

The second alternative and competing hypothesis is stated as follows:
Hypothesis 1B: Compared to securitized loans, portfolio-held loans are more likely to be foreclosed upon and less likely to be restructured.

Given the institutional features listed above, we expect that portfolio-held loans experience shorter time to resolution. Portfolio lenders are the sole decision-maker in the workout process and thus have more flexibility in terms of choosing a workout strategy. In addition, portfolio lenders fully internalize the costs and benefits of any resolution decision. Hence, they are more likely to act quickly.

As hypothesized above, portfolio lenders are likely to take prompt actions to resolve distress. In this scenario owners of distressed real estate are less likely to incur additional risks and delay necessary capital improvements or renovations. Consequently, the distressed property might result in a smaller loss to the portfolio lenders and are less likely to be liquidated at a sub-optimal value. We expect the capital recovery rate of foreclosed portfolio loans is higher than those of securitized loans.

Hypothesis 2: Compared to securitized loans, portfolio-held loans experience shorter time to resolution.

Hypothesis 3: The capital recovery rate of foreclosed loans that are held in a portfolio is higher than those of foreclosed loans that are privately securitized.

3. Data

The distressed commercial real estate data is from Real Capital Analytics (RCA).[1] Since 2008, RCA has tracked loan level and property level economic distress in the commercial real estate markets. RCA identifies the troubled mortgages as in delinquency/default or maturity default and records the date. The data track the performance and resolution of distressed loans. The distressed status is updated across the lifecycle of a property. RCA data capture information about property characteristics and loan characteristics at origination.

Our sample includes commercial mortgages that became troubled beginning with the first quarter of 2008 and tracks the performance of those mortgages until the third quarter of 2012. We include only the distressed loans that are securitized through private-label mortgage backed securities, namely CMBS. We classify the resolution outcomes as restructure and liquidation. Restructure includes loan refinancing, modification, extension and mezz takeover. Liquidation includes foreclosure and sale through other practices, such as short sale and receivership sale.

[1] We gratefully acknowledge Real Capital Analytics (RCA) for providing the distressed real estate data.

Foreclosure includes lender REOs, trustee sales and foreclosure post-sales.[2] Our sample includes 11340 commercial mortgages that become troubled at some point during the study period. After deleting observations where we cannot identify the lender and do not have loan or property characteristics data at origination, our final sample includes 4075 distressed commercial mortgages. Table 1 defines our set of variables.

Table 2, Panel A reports the descriptive statistics of distressed commercial real estate loans during the sample period of 2008 Q1 to 2012 Q3. We find that 61.4% of distressed commercial loans in our sample are securitized, 30.8% are portfolio loans held by banks, 7.8% are portfolio loans held by other private lenders, such as insurance companies, pension funds. 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 retail and office properties, respectively. This equates to a total outstanding balance of distressed loans secured by retail and office properties of $29.5 billion and $14.7 billion. In terms of regions, the percentage of distressed commercial real estate loans is highest in the southeast and southwest regions at 28.5% and 24.4%, respectively. The total outstanding balance of distressed loans is about $17.2 billion in the southwest 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 crisis. The total outstanding balance of those distressed loans is over 35 billion.

Table 2 Panel A also presents the average time to resolution and average recovery rate in different category. Time to resolution is calculated as the number of months from the loan becoming troubled to final resolution, either as a restructure or liquidation. Recovery rate is the resolved proceeds from sale, divided by total outstanding balance of the first mortgage loan at the time of default. Securitized loans experience a longer time to resolution with an average time

[2] RCA classifies the distress status into three major groups – Troubled, Restructured/Extension and Resolved. *Troubled* includes foreclosures, 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's internal comments for each loan.

to resolution of 13.3 months, compared to 7.2 months for portfolio loans. The average recovery rate of securitized loans and portfolio loans are similar at about 70%. Among different property types, distressed loans secured by office and hotel properties experience shorter time to reach resolution at about 10 months and distressed loans secured by office and industrial properties have higher average recovery rate at 74%. 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 and Mid-Atlantic region show the highest recovery rate at 77%. 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 2004 and 2008 have highest recovery rate at about 75%.

Table 2 Panel B presents the summary statistics of all distressed commercial loans in our sample and across securitized and portfolio loans. The table shows that during our sample period, the percentage of distressed loans resolved through foreclosure (49%) or liquidation (56%) is substantially higher than through restructure (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 recovery rate is 70%. The difference-in-mean test statistics also confirms the significant difference in time to resolution between securitized loans and portfolio loans.

We control for the financial information of individual loans. *DistressedSize* is the outstanding balance of the first mortgage. *LoanAge* is the number of months from origination to the start date of the distressed cycle. Table 2 Panel B shows that the average loan-to-value ratio of distressed loans in our sample is 21%. The average loan age is 50.13 months. About 59% of distressed loans are fixed rate mortgages. The difference-in-mean test shows the significant difference in loan characteristics between securitized loans and portfolio loans.

4. Empirical Analysis

Our goal is to investigate the role of securitization in the financial resolution of distressed commercial mortgages. We explore this issue from two perspectives. First, we examine whether differences in foreclosure rates of distressed loans depend on their securitization status. Specifically, we test the relationship between securitization status and the likelihood of foreclosure using a sample of distressed commercial real estate loans that are either portfolio-held or securitized during the period of 2008 Q1 to 2012 Q3. Second, we analyze the impact of securitization on the length of time to resolution and the capital recovery rate for foreclosed loans. We discuss the empirical analyses and results in this section.

4.1 Resolution outcome across mortgage types and test windows

We begin the analysis by examining the percentage of different resolution outcomes across distress time horizon and whether it is a portfolio loan or securitized. Table 3 presents summary statistics about resolution outcomes of distressed loans by time elapsed since they became troubled. Panel A shows the statistics for the entire sample. Panel B shows the statistics for portfolio loans and securitized loans.

The results show that the most common resolution within the first 6 months of becoming troubled is liquidation and, specifically, foreclosure. About 23.8% of distressed loans are liquidated and 21.9% are foreclosed. The liquidation and foreclosure rate decrease significantly, more than half, within the 9 months (9% and 7.4%) and 12 months (8.4% and 7.1%) of default. Restructure takes place in about 1.3% of all cases within 6 months and remains low at about 1.6% within 9 months and 1.5% within 12 months. Compared to previous literature based on residential mortgage data (e.g. Agarwal et al, 2011), this restructure rate is particularly low.

Comparing securitized loans and portfolio loans, the likelihood of liquidation and foreclosure is 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 and decreases with the time. In contract, for securitized loans, the restructure rate is lowest within 6 months (1.5%) and increases to 2.9% within 18 months. Previous literature in distressed debt workout points out that negotiation appears to be easier when the debt is privately placed and owned by fewer

lenders. One possible reason is that it may be easier to negotiate with a portfolio lender in which case requires less time to reach an agreement.

An interesting fact is that the percentage of distressed loans with no resolution is lower within 6 months and within 18 months. In addition, the rate of "no resolution" is lowest for portfolio loans across all time frames, which may suggest that portfolio lenders take a more active approach to resolve distress.

4.2 The determinants of resolution outcome

In this section, we examine the determinants of the financial resolution of distressed loans. We employ a Probit approach to examine the relationship between securitization and the resolution outcome, with a focus on foreclosure. The basic model setup is as follows:

$$\Pr(\mathrm{R}_i|\mathrm{distressed})_i = \Phi(\alpha+\beta\times\mathrm{PortfolioLoan}_i+\gamma\times\mathrm{control\ variables}_i+\varepsilon_i) \qquad (1)$$

The dependent variable, R_i, is an indicator variable, which equals one if a distressed loan i is liquidated or foreclosed. The explanatory variable of interest is $PortfolioLoan_i$, which is a dichotomous variable to indicate whether a commercial loan is privately securitized or 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, including loan-to-value ratio, loan age, distressed size, property type and year of origination dummies. We also include the cumulative NCREIF property index return of the core property types over the sample period to control for market conditions.

However, loans that are selected to be securitized could be systematically different from those held in the portfolio. Hence, to control for the sample selection bias, following Ambrose, Capone and Deng (2001) and Cheng and Deng (2013), we employ the Heckman 2-stage approach. In the first stage, we regress a securitization indicator in a sample of all loans (securitized and portfolio loans) on a set of loan and property characteristics at the time of origination, and estimate the

inverse Mills ratio.[3] In the second stage, we include the inverse Mills ratio from the first-stage model as an additional explanatory variable in the model. 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.

The empirical results are presented in Table 4. In the analysis, we estimate model (1) across the entire sample period and within a given time frame. 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 have a significantly greater likelihood of liquidation and foreclosure. The portfolio loans are more likely to be foreclosed instead of restructured. Our results are contradictory to previous evidence based on a sample of residential mortgages, e.g. Agarwal (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. Our results suggest that distressed commercial mortgages are managed differently in the commercial real estate market as compared to the residential real estate market.

The regressions also present evidence about other factors affecting the likelihood of foreclosure. We find that distressed loans with larger distress sizes and more seasoning (i.e., longer time from origination) are less like to be foreclosed. Distressed loans with fixed rates are more likely to be foreclosed. In terms of property type, distressed loans secured by apartment properties are more likely to be foreclosed while distressed loans secured by hotel properties are less likely to be foreclosed. In addition, the likelihood of foreclosure is lower when the market is better.

[3] In the first stage, we run a probit model to examine the determinants of commercial loans selected to be securitized. We find evidence that banks are less likely to secure loans than nonbanks. which is consistent with Gonas, Highfield and Mullineaux (2004). We also find a lower incidence of securitization on larger loans, which is consistent with Boot, Thakor and Udell (1991). The empirical results are available upon request.

4.3 Time to resolution and recovery rate

We further examine whether securitization affects the time to resolution and the capital recovery rate of distressed loans in the commercial real estate market. Time to resolution is calculated as number of months from the loans becoming distressed to final resolution. The recovery rate is calculated 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.

Table 5, Panel A presents the recovery rate of distressed loans foreclosed within 6, 9, 12, 18 months from becoming troubled. The results show that the recovery rate of foreclosed portfolio loans is higher than those of securitized loans across all time frames. The recovery rate of the loans that are resolved within 9 and 12 months is higher than those resolved within 6 and 18 months.

Furthermore, we employ a Tobit regression approach to examine the impact of securitization on time to resolution and recovery rate for all resolved loans and loans that are foreclosed. Column (1) and (3) in Table 5, Panel B show that the coefficients of portfolio loan indicator variables are significantly negative, which suggest that it takes longer for a securitized loan to reach resolution in the distress cycle. As discussed previously, there are several reasons that may cause a longer resolution period. Column (2) and (4) in Table 5, Panel B show that securitization has a significant impact on the recovery rate of foreclosed loans, but not on the recovery rate of loans with other resolution outcomes. In foreclosure, the recovery rate of portfolio loans is higher than those of securitized loans. The results in Table 5, Panel B indicate that portfolio loans experience shorter time and higher recovery during the foreclosure process, which is consistent with our hypothesis 2 and hypothesis 3.

For the control variables, we find that the time to resolution is shorter for larger loans and more seasoned loans. The time to resolution of distressed loans secured by apartment properties is shorter and the time to resolution of distressed loans secured by industrial properties is longer, compared to other property types. The recovery rate is lower for a distressed loan with higher loan-to-value ratio at origination.

4.3 Robustness check

We run several robustness tests. The results are reported in Table 6. We begin with Column (4) of Table 6 where we include two additional control variables, namely capitalization rate and occupancy rate at origination. The results in Column (4) show that the coefficient on portfolio loan indicator variable is positive and significant. Next we turn to the first three columns. Here 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. Next, 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. 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 and other institutional reasons. We find no significant relationship between securitization and the likelihood of foreclosure for loans that became distressed during the crisis period. But the positive relationship between portfolio lending and the likelihood of foreclosure holds post crisis.

5. Conclusion

This paper seeks to shed new light on how 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 for securitized and portfolio loans. The data set is constructed based on the recent financial crisis and includes a diverse set of lenders. The main hypotheses address the impact of securitization on resolution outcome, time to resolution and capital recovery rates.

We find that portfolio loans are more likely to be foreclosed upon relative to securitized loans. We also find that portfolio loans experience shorter time to resolution and higher recovery rate in the foreclosure process. The study is intended to contribute 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.

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Fig. 1 Financial resolution of distressed loans

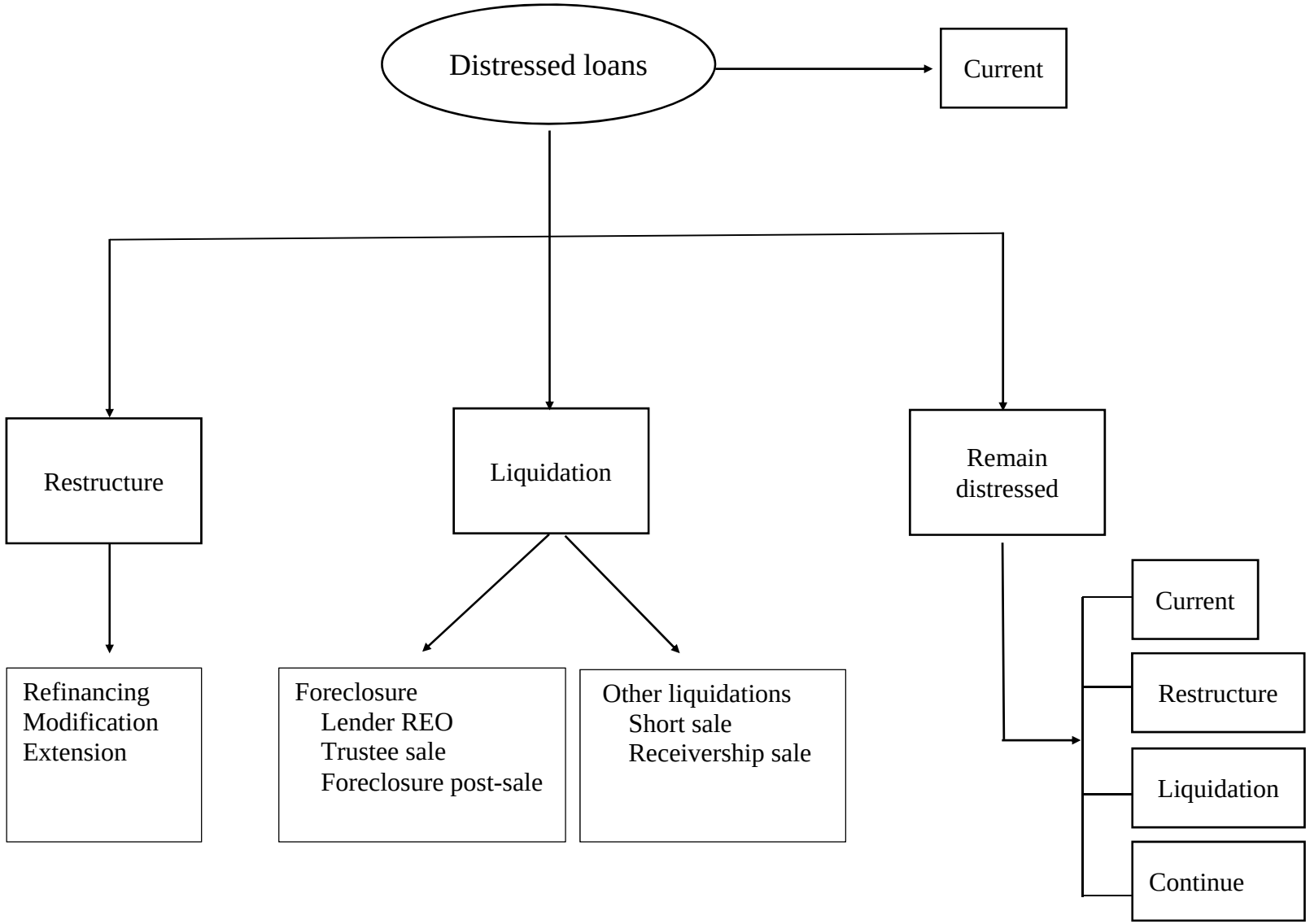

Table 1 Definition of variables

Variables	Measures
Resolution Variable	
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
Liquidation	Variable to indicate liquidation as the resolution outcome, which includes foreclosure and other types of liquidation, such as short sale and receivership sale
Restructure	Variable to indicate restructure as the resolution outcome, which includes loan refinancing, loan modification and extension.
TimeToResolution	Number of months from the loan becoming distressed to final resolution
RecoveryRate	Resolved proceeds (or gross proceeds from the disposition) / total outstanding balance of the first mortgage loan at the time of default
Mortgage type variable	
PortfolioLoan	Indicator variable equals 1 if the loan is held in lenders' portfolio
Loan /Property characteristics	
LTVatorig	Loan-to-Value ratio at origination
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
FixedLoan	Indicator variable equals 1 if a fixed-rate mortgage
Term15year	Indicator variable equals 1 if loan term is 15 years or longer
CapRate	NOI/Value, ratio of net operating income divided by the property value at origination
OccupancyRate	Occupancy rate at origination
Apartment	Indicator variable equals 1 if the property type is apartment
Hotel	Indicator variable equals 1 if the property type is hotel
Industrial	Indicator variable equals 1 if the property type is industrial
Office	Indicator variable equals 1 if the property type is office
Retail	Indicator variable equals 1 if the property type is retail
Market Conditions	
MarketIndex	Cumulative NCREIF property index return of five core property types over the sample period, namely apartment, hotel, industrial, office and retail

Table 2 Summary Statistics

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 distressed loans are delinquent or in default. Panel A presents the number and percentage of distressed loan, total outstanding balances of first mortgage loans, average time to resolution and average recovery rate by loan type, property type, loan size and region. Panel B presents the summary statistics of variables used in the regression analysis. The complete description of variables is provided in Table 1. The p-values of difference-in-mean test statistics are reported in parenthesis.

Panel A. 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 Mortgage Type					
Securitized loans	2504	61.4	50243.3	13.3	70.8
Portfolio loans	1571	38.6	20968.1	7.2	70.6
- held by banks	1254	30.8	15160.6	7.9	68.5
- held by other lenders	317	7.8	5807.5	6.5	72.7
By Property Type					
Retail	1062	26.1	29547.4	11.0	67.9
Office	991	24.3	14749.5	10.3	74.5
Apartment	932	22.9	12280.5	11.5	62.2
Industrial	642	15.8	5496.3	11.0	73.9
Hotel	448	11.0	9137.7	10.4	71.4
By Loan Size					
<$2m	222	5.4	522.6	10.6	72.3
$2m-$4m	777	19.1	2302.2	8.8	74.9
$4m-$7m	894	21.9	4871.1	9.9	68.1
$7m-$15m	981	24.1	10083.5	11.2	67.7
$15m-$25m	545	13.4	10533.0	12.6	69.1
>$25m	656	16.1	42898.9	12.3	71.9
By Region					
Southeast	1163	28.5	17228.8	10.2	72.7
Southwest	993	24.4	15433.2	10.7	66.0
West	830	20.4	11847.5	9.7	66.9
Midwest	551	13.5	8169.4	13.7	69.6
Northeast	328	8.0	12881.3	11.5	76.9
Mid-Atlantic	210	5.2	5651.2	13.0	76.9
By Origination Year					
prior to 2004	230	5.6	2754.4	10.9	71.2
2004	375	9.2	6352.1	10.6	75.1
2005	831	20.4	14432.7	11.6	67.7
2006	1205	29.6	21530.3	11.7	68.8
2007	1263	31	23863.4	10.3	70.1
2008	146	3.6	2153.5	6.5	75.4
All Distressed Loans	4075	100.0	71211.4	10.8	70.1

Panel B. Summary statistics of dependent and independent variables

Variable	All distressed loans			Securitized loans			Portfolio loans			
	N	Mean	Std	N	Mean	Std	N	Mean	Std	Difference-in-mean test
Foreclosure	4075	0.49	0.5	2504	0.42	0.49	1571	0.59	0.49	(0.000)
LenderREO	4075	0.36	0.48	2504	0.32	0.47	1571	0.42	0.49	(0.000)
Liquidation	4075	0.56	0.5	2504	0.49	0.5	1571	0.67	0.47	(0.000)
Restructure	4075	0.06	0.24	2504	0.09	0.28	1571	0.02	0.15	(0.000)
TimeToResolution	2527	10.84	9.1	1439	13.32	9.41	1088	7.21	7.51	(0.000)
RecoveryRate	1616	0.70	0.27	809	0.71	0.28	807	0.71	0.26	(0.315)
LTVatorig	4075	0.82	0.64	2504	0.73	0.16	1571	0.96	1.00	(0.000)
DistressedSize	4075	15.96	1.12	2504	16.18	1.05	1571	15.61	1.12	(0.000)
LoanAge	4075	50.13	20.29	2504	53.52	20.5	1571	44.72	18.76	(0.000)
FixedLoan	4075	0.69	0.46	2504	0.97	0.18	1571	0.24	0.43	(0.000)
Term15year	4075	0.01	0.08	2504	0.01	0.07	1571	0.01	0.1	(0.000)
CapRate (%)	2115	7.10	0.02	1770	7.17	0.02	345	6.73	0.02	(0.000)
OccupancyRate	2683	0.88	0.2	2060	0.91	0.13	623	0.77	0.33	(0.000)
Apartment	4075	0.23	0.43	2504	0.21	0.41	1571	0.29	0.46	(0.044)
Hotel	4075	0.11	0.31	2504	0.09	0.28	1571	0.15	0.35	(0.000)
Industrial	4075	0.16	0.36	2504	0.14	0.35	1571	0.19	0.39	(0.000)
Office	4075	0.24	0.44	2504	0.29	0.46	1571	0.21	0.40	(0.000)
Retail	4075	0.26	0.42	2504	0.27	0.44	1571	0.17	0.37	(0.000)
MarketIndex-Apartment	4075	0.07	0.05	2504	0.07	0.05	1571	0.07	0.05	(0.000)
MarketIndex-Hotel	4075	0.03	0.05	2504	0.03	0.05	1571	0.03	0.05	(0.064)
MarketIndex-Industrial	4075	0.04	0.04	2504	0.04	0.04	1571	0.04	0.04	(0.022)
MarketIndex-Office	4075	0.04	0.04	2504	0.04	0.04	1571	0.04	0.05	(0.008)
MarketIndex-Retail	4075	0.07	0.04	2504	0.07	0.04	1571	0.06	0.04	(0.031)

Table 3 Financial Resolution within a Given Timeframe

This table presents the resolution outcome of distressed commercial mortgages in a given time frame. 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 distressed loans are delinquent or in default. *Restructure* includes loan refinancing, loan modification, extension, mezz takeover. *Foreclosure* includes lender REO, trustee sale and foreclosure post-sale. *Other liquidations* include 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 A. Resolution outcomes within 6, 9, 12, 18 months: All commercial real estate loans

	All distressed loans			
	Resolution within a given time frame (in %)			
	6 months	9 months	12 months	18 months
	(1)	(2)	(3)	(4)
Restructure	1.3	1.6	1.5	2.3
Total Liquidation	23.8	9.0	8.4	13.5
- Foreclosure	21.9	7.4	7.1	11.1
- Other	1.9	1.7	1.3	2.4
No resolution	74.9	89.4	90.1	84.2
# of distressed loans	4075	3053	2729	2459

Panel B. Resolution outcomes within 6, 9, 12, 18 months: Securitized loans versus Portfolio loans

	Securitized distressed loans					Distressed loans held in portfolio			
	Resolution within a given time frame (in %)					Resolution within a given time frame (in %)			
	6 months	9 months	12 months	18 months		6 months	9 months	12 months	18 months
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
Restructure	1.5	2.0	2.0	2.9	Restructure	1.0	0.6	0.4	0.9
Liquidation	13.8	6.3	7.9	12.5	Liquidation	39.7	15.3	9.7	15.9
- Foreclosure	12.7	5.1	6.3	10.4	- Foreclosure	36.6	12.5	9.1	12.9
- Other	1.1	1.2	1.5	2.1	- Other	3.1	2.8	0.6	3.0
No resolution	84.7	91.7	90.2	84.6	No resolution	59.3	84.1	89.9	83.2
# of distressed loans	2504	2122	1946	1755	# of distressed loans	1571	931	783	704

Table 4 Determinants of Resolution Outcome

This table presents the maximum-likelihood parameter estimates from the Probit regression of resolution outcome on the portfolio lending indicator variable, loan and property characteristics and housing market condition. The sample tracks the resolution of distressed commercial mortgages 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. The dependent variable equals 1 if the distressed loan is "Liquidated", "Foreclosed" or becomes "Lender REO" during the sample period, within 6 or 12 months from the start of distress cycle. The complete description of variables is provided in Table 1. Inverse mills ratio is calculated using the Heckman 2-stage model to correct for sample selection bias. we regress a securitization indicator in a sample of all loans (securitized and portfolio loans) on loan and property characteristics at the time of origination. Wald test statistics is reported in parenthesis, ***, ** and * denote statistical significance at 1%, 5% and 10% levels.

	Liquidation			Foreclosure			LenderREO		
	All	within 6 months	within 12 months	All	within 6 months	within 12 months	All	within 6 months	within 12 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PortfolioLoan	0.52***	0.89***	0.46***	0.46***	0.86***	0.46***	0.3***	0.69***	0.37***
	(56.07)	(147.25	(22.03)	(45.14)	(136.36	(19.94)	(19.24)	(79.78)	(10.86)
LTVatorig	0.01	-0.01	0.01	0.0001	-0.02	0.02	0.05	0.0001	0.05
	(0.09)	(0.14)	(0.03)	(0.00)	(0.41)	(0.17)	(2.01)	(0.01)	(1.25)
DistressedSize	-0.05**	-0.03	0.0001	-0.04*	-0.04*	0.01	-0.08***	-0.11***	-0.02
	(3.99)	(1.96)	(0.01)	(2.81)	(3.02)	(0.03)	(12.91)	(16.06)	(0.21)
LoanAge	-0.01***	0.0001**	0.0001	-0.01***	0.0001**	0.0001	-0.01***	0.0001	0.0001
	(63.32)	(14.71)	(0.71)	(39.91)	(14.7)	(0.27)	(43.4)	(0.71)	(1.97)
FixedMortg	0.19***	0.16**	0.12	0.16**	0.14**	0.08	0.14**	0.12	0.15
	(7.44)	(5.05)	(1.39)	(5.34)	(4.04)	(0.68)	(4.23)	(2.45)	(1.91)
Term 15 year	0.26	0.3	0.09	-0.04	0.04	-0.07	-0.27	-0.15	-0.2
	(0.93)	(1.32)	(0.06)	(0.02)	(0.02)	(0.03)	(1.05)	(0.26)	(0.17)
Apartment	0.26***	0.1	0.32***	0.14**	0.08	0.18**	-0.05	0.01	0.01
	(18.37)	(2.25)	(15.44)	(6.01)	(1.58)	(4.52)	(0.58)	(0.02)	(0.02)
Hotel	-0.05	-0.19**	0.07	-0.04	-0.22**	-0.06	0.09	-0.19**	0.01
	(0.45)	(5.06)	(0.45)	(0.31)	(6.16)	(0.23)	(1.4)	(4.42)	(0.00)
Industrial	-0.11	-0.26***	0.2**	-0.07	-0.25***	0.19**	0.03	-0.2**	0.19*
	(2.67)	(11.74)	(4.57)	(1.02)	(10.57)	(4.26)	(0.22)	(6.15)	(3.68)
Retail	-0.03	-0.05	0.08	-0.02	-0.02	0.1	0.04	0.04	0.09
	(0.27)	(0.46)	(0.99)	(0.12)	(0.12)	(1.23)	(0.37)	(0.25)	(1.03)
MarketIndex	-3.03***	-3.16***	-2.54***	-0.02	-1.69***	-0.59	2.53***	-0.13	0.4
	(40.77)	(40.66)	(17.57)	(0.00)	(11.16)	(0.82)	(29.64)	(0.06)	(0.31)
Inverse Mills Ratio	0.08	-0.24***	0.04	0.0001	-0.21***	0.02	0.07	-0.07	0.03
	(1.43)	(11.22)	(0.24)	(0.01)	(8.63)	(0.04)	(1.07)	(0.77)	(0.1)
Constant	1***	-0.45	-1.37***	0.58*	-0.44	-1.53***	0.82**	(1.07)	-1.29**
	(8.43)	(1.4)	(8.49)	(2.97)	(1.31)	(9.52)	(5.68)	0.41	(5.79)
N	4075	4075	3053	4075	4075	3053	4075	4075	3053
Pseudo R2	0.05	0.1	0.03	0.03	0.09	0.02	0.03	0.06	0.01
Likelihood Ratio	289.08	442.83	79.78	176.25	382.99	54.64	133.98	229.07	28.78

Table 5 Time to Resolution and Recovery rate

This table reports the results of time to resolution and recovery rate. Panel A presents the recovery rate of distressed loans that are liquidated within a given time frame. Panel B presents the results of Tobit regressions of time to foreclosure and recovery rate on portfolio lending indicator variable, loan and property characteristics and housing market condition. The sample tracks the resolution of distressed commercial mortgages 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. *Time to Foreclosure* is calculated as number of months from the loan becoming distressed to foreclosure completed. *Recovery Rate* is the ratio of resolved proceeds, gross proceeds from the disposition through trustee sales or foreclosure post-sales, over total outstanding balance of the first mortgage loan at the time of default. The complete description of variables is provided in Table 1. 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 all loans (securitized and portfolio loans) on loan and property characteristics at the time of origination. Wald test statistics is reported in parenthesis, ***, ** and * denote statistical significance at 1%, 5% and 10% levels.

Panel A. Recovery Rate of distressed loans resolved in different time frames

	All distressed loans			
	Recovery rate of loans that are liquidated within a given time frame (in %)			
	6 months	9 months	12 months	18 months
	(1)	(2)	(3)	(4)
Liquidation	67.9	70.9	73.4	66.9
- Foreclosure	66.2	68.1	72.0	61.4
- Other	81.5	78.5	78.1	83.9

	Securitized distressed loans			
	Recovery rate of loans that are liquidated within a given time frame (in %)			
	6 months	9 months	12 months	18 months
	(5)	(6)	(7)	(8)
Liquidation	63.8	75.6	71.3	68.7
- Foreclosure	60.8	73.2	67.3	65.3
- Other	84.3	81.2	78.7	79.0

	Distressed loans held in portfolio			
	Recovery rate of loans that are liquidated within a given time frame (in %)			
	6 months	9 months	12 months	18 months
	(9)	(10)	(11)	(12)
Liquidation	69.9	67.2	76.5	64.0
- Foreclosure	68.7	64.5	76.7	55.2
- Other	80.0	75.9	74.2	92.6

Panel B. Tobit regression

	Resolved		Foreclosure	
	Time to Resolution	Recovery Rate	Time to Resolution	Recovery Rate
	(1)	(2)	(3)	(4)
PortfolioLoan	-0.62***	0.02	-0.97***	0.11**
	(-4.88)	(0.88)	(-3.71)	(2.05)
LTVatorig	0.09	-0.06***	0.16	-0.15***
	(1.56)	(-3.89)	(1.38)	(-3.39)
DistressedSize	-0.25***	-0.02*	-0.38***	-0.03*
	(-6.16)	(-1.81)	(-4.57)	(-1.75)
LoanAge	-0.02***	0.0001	-0.03***	0.0001
	(-8.89)	(-0.74)	(-6.69)	(-0.46)
FixedMortg	-0.12	-0.01	-0.16	-0.05
	(-1)	(-0.48)	(-0.65)	(-0.91)
Term 15 year	-0.68	0.08	-0.74	-0.18
	(-1.29)	(0.86)	(-0.7)	(-0.91)
Apartment	-0.05	0.14***	-0.39*	0.19***
	(-0.44)	(5.93)	(-1.84)	(3.77)
Hotel	0.2	0.11***	0.43	0.07
	(1.47)	(3.32)	(1.58)	(1.02)
Industrial	0.19	0.11***	0.44*	0.16**
	(1.56)	(3.56)	(1.84)	(2.46)
Retail	0.11	0.04*	0.08	0.07
	(1)	(1.73)	(0.36)	(1.18)
MarketIndex	6.2***	-0.06	16***	1.73***
	(6.22)	(-0.37)	(8.29)	(4.62)
Inverse Mills Ratio	0.74***	0.01	0.94***	-0.02
	(6.11)	(0.53)	(3.81)	(-0.4)
Constant	5.36***	0.87***	5.62***	0.78***
	(8.82)	(6.43)	(4.59)	(2.7)
N	2527	1616	2527	1616
Pseudo R2	0.03	0.12	0.03	0.11
Log Likelihood	715.2	651.67	682	847.78

Table 6 – Robustness Check

This table presents the results of robustness checks. The sample tracks the resolution of distressed commercial mortgages 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. The dependent variable equals 1 if the loan is "Foreclosed" during the sample period. Model (1) uses the subsample of distressed commercial loans with banks being the portfolio lenders and compares to securitized loans. Model (2) uses the subsample of commercial mortgages that became troubled during the crisis period, which is from the beginning of sample period till June 30, 2009. Model (3) uses the subsample of commercial mortgages that became troubled post crisis. Model (4) includes additional variables to control for property characteristics, namely *CapRate* and *Occupancy Rate*. *CapRate* is the ratio of net operating income divided by the property value at origination The complete description of variables is provided in Table 1. Inverse mills ratio is calculated using the Heckman 2-stage model to correct for sample selection bias we regress a securitization indicator in a sample of all loans (securitized and portfolio loans) on loan and property characteristics at the time of origination. Wald test statistics is reported in parenthesis, ***, ** and * denote statistical significance at 1%, 5% and 10% levels.

	Foreclosure			
	portfolio loan held by bank	loans became distressed during crisis period	loans became distressed post crisis	With additional controls
	(1)	(2)	(3)	(4)
PortfolioLoan	0.39***	0.2	0.55***	0.39**
	(26.42)	(1.04)	(54.11)	(6.24)
LTVatorig	0.02	-0.01	0.01	0.86***
	(0.41)	(0.08)	(0.09)	(7.38)
DistressedSize	-0.06**	-0.03	-0.02	-0.15***
	(6.12)	(0.35)	(0.5)	(14.37)
LoanAge	-0.01***	0.0001	-0.01***	-0.01***
	(41.35)	(0.00)	(17.2)	(21.55)
FixedMortg	0.15**	0.15	0.14*	0.1
	(4.01)	(0.64)	(3.59)	(0.37)
Term 15 year	0.36	-0.17	0.02	-0.11
	(1.7)	(0.04)	(0.01)	(0.06)
CapRate				-1.62
				(0.61)
OccupancyRate				-0.52
				(1.02)
Apartment	0.16***	0.27**	0.08	0.21**
	(6.97)	(5.89)	(1.24)	(5.61)
Hotel	0.0001	0.36**	-0.06	-0.13
	(0.00)	(4.01)	(0.45)	(0.46)
Industrial	-0.08	-0.02	-0.02	0.14
	(1.3)	(0.02)	(0.07)	(1.82)
Retail	-0.01	0.0001	0.02	0.08
	(0.03)	(0.00)	(0.08)	(0.85)
MarketIndex	0.13	0.04	1.76**	1.17*
	(0.07)	(0.00)	(4.7)	(2.81)
Inverse Mills Ratio	0.02	-0.39**	0.04	0.16
	(0.08)	(6.2)	(0.26)	(1.77)
Constant	0.89**	0.79	0.01	2.16***
	(6.17)	(1.29)	(0.00)	(6.92)
N	3758	911	3164	1783
Pseudo R2	0.03	0.02	0.03	0.04
Likelihood Ratio	145.97	31.01	152.78	95.95