Recourse and Cross-Collateralization as Shadow Equity*

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Abstract

We examine the CRE loan portfolios of the largest U.S. banks to comprehensively investigate the extent to which lenders value recourse and cross-collateralization as alternative forms of equity. We show that loans with recourse or cross-collateralization have higher LTVs, controlling for an array of potentially confounding factors. Furthermore, recourse and cross-collateralized loans secured by stabilized properties command lower spreads at origination and were less likely to require accommodation during the COVID-19 pandemic.

Keywords: commercial real estate, recourse, LTV, cross-collateralization
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1. INTRODUCTION

Commercial mortgages are complicated contracts, with a range of possible terms based on a back-and-forth negotiation between the lender and borrower. Loans that appear risky along one dimension, such as loan-to-value (LTV) ratios, often have other characteristics to mitigate those risks.[1] Some of these contractual terms—recourse and cross-collateralization—can act as a type of "shadow equity," providing lenders access to borrowers' assets beyond the principal mortgaged property and thus reducing some of the risks of borrower leverage.

*The views expressed in this paper are solely those of the authors and do not reflect the opinions of the Federal Reserve Board, the Federal Reserve Bank of Cleveland or the Federal Reserve System.

[1]See Ambrose and Sanders (2003), Harrison et al. (2004), Titman et al. (2005), and Grovenstein et al. (2005) for examples.

In theory, recourse and cross-collateralization could provide significant value to banks (Childs et al., 1996). Recourse provides lenders the ability to seek a deficiency judgment to recoup losses after liquidating a loan's collateral.[2] Cross-collateralization pledges properties securing other loans as collateral, allowing banks to recoup equity in those additional properties in a liquidation. If either enhancement is present in a loan contract, the additional equity should reduce losses in the event of default, better incentivize borrowers to avoid default if they have the means of making loan payments, and mitigate the debt overhang problem (Myers, 1977). However, the magnitude of such effects is unclear due to the high costs of foreclosure and liquidation relative to the value of any additional collateral in the event of default.

In this paper, we take advantage of detailed, loan-level data on the commercial real estate (CRE) portfolios of the largest U.S. banks to perform a comprehensive analysis of the value of recourse and cross-collateralization. These data are particularly well-suited for our study, as bank loans exhibit substantial heterogeneity in their use of such forms of shadow equity: about three-quarters of loans have recourse and nearly 10 percent are cross-collateralized.[3] Furthermore, the detail and granularity of the data allow us to assess how shadow equity affects other underwriting characteristics (such as LTV and loan rate spreads), as well as loan performance.

Our analysis makes three contributions to the literature. First, we demonstrate that loans with recourse and cross-collateralization command lower loan rates, suggesting lenders value how recourse and cross-collateralization mitigate the debt overhang problem and reduce the incentive for strategic default. Spreads on loans secured by stabilized properties are about 20 basis points lower for recourse loans and 10 basis points lower for loans with cross-collateralization.

Second, we show that shadow equity indeed serves as a substitute for more conventional forms of equity. For loans backed by stabilized properties, LTV ratios at origination are about 3 percentage points higher for loans with recourse or cross-collateralization. This suggests that in addition to lowering interest costs, these alternative forms of equity provide a means of property owners funding an investment when they lack the liquid assets to make a down payment satisfying normal underwriting metrics.

Third, we demonstrate that recourse and cross-collateralization affected loan performance when the CRE market came under stress during the COVID-19 pandemic. Re-

[2]White and Kitchen (2013) provides a useful summary of differences between recourse and non-recourse CRE loans. They emphasize that one of the key advantages for a recourse loan is greater flexibility in pricing and loan structure, something we explore explicitly in our paper.

[3]Banks' usage of shadow equity differs from the other major sources of CRE finance (CMBS and life insurance companies) which almost uniformly provide non-recourse loans.

course loans secured by stabilized properties were significantly less likely to be downgraded or require a modification than non-recourse loans.[4] We find no such benefit for cross-collateralization; however, this is due in large part to the poor performance of cross-collateralized hotel and retail loans, for which the widespread nature of the COVID-shock eroded the value of having additional collateral.

We center our analysis around commercial loans secured stabilized properties as we are better able to control for key characteristics affecting risk premiums on such loans. Loans against transitional properties, such as loans to fund renovation or construction projects, have historically been much riskier. Furthermore, the risks associated with such loans are highly dependent on the business model of a particular borrower and thus are less well captured by the loan and property controls employed in our analysis. Indeed, when we repeat our analysis for loans against transitional properties, we find results broadly consistent with banks requiring additional equity to offset other risks. For one, loans with shadow equity have significantly higher LTVs, beyond the effects we find for stabilized properties. Additionally, loans with recourse have somewhat higher loan rates and worse loan performance, pointing towards the additional equity being required to offset other unobserved risks.

Our paper is closely related to the literature on the use of recourse or cross-collateralization in real estate lending. The existing literature studying such forms of shadow equity in commercial mortgage contracts is largely theoretical. The models of Childs et al. (1996) and Lebret and Quan (2017) demonstrate that such credit enhancements allow borrowers lowers spreads or higher leverage.[5] To our knowledge, the only other paper that empirically studies recourse in commercial mortgages is Binder and Kim (2019), who show that recourse has little ability to predict future defaults. By contrast, there is more empirical work on the use of recourse in residential mortgage lending, most notably Ghent and Kudlyak (2011).[6]

We also contribute to work showing how the joint determination of various under-

[4]It is important to consider negative outcomes like defaults or delinquency, as well as modifications (such as extensions) in measuring distress among bank loans. Black et al. (2017) documents that banks are much more likely than securitized lenders to modify loans in order to mitigate losses. Renegotiations of commercial mortgages are also much more frequent than what is seen in residential mortgages, as there is less asymmetric information between borrowers and lenders (Adelino et al., 2013).

[5]In addition, Corbae and Quintin (2015) explores the role of leverage in inducing foreclosures in the Great Recession and its aftermath. The authors include an extension of their model, finding that recourse can play an important role in mitigating foreclosures by reducing the incentive for strategic default.

[6]Ghent and Kudlyak (2011) show that many residential mortgages are subject to recourse, depending on the state. Exploiting these state differences in the legality of recourse, the authors find that recourse acts as a strategic default deterrent and induces more lender-friendly default when default does occur, among other findings. Interestingly, the authors find higher interest rates on mortgages in recourse states, which they leave as a puzzle. With our data's more granular loan-level heterogeneity in recourse, we show recourse is associated with lower spreads, consistent with theory.

writing characteristics can complicate the analysis of the effects of borrower leverage. Loans may have low LTVs to offset other unobserved risks, and thus not be associated with lower default risk (Grovenstein et al., 2005; Ambrose and Sanders, 2003) or lower spreads (Titman et al., 2005). Likewise, borrowers may choose low LTVs if default is more costly (Harrison et al., 2004). We show empirically that higher recourse or cross collateralization is also a substitute for lower LTVs. That higher LTV loans disproportionately have these alternative forms of equity potentially also mitigates risks associated with borrower leverage.

The rest of the paper is structured as follows. In Section 2 we discuss in the data used in our analysis. In Section 3 we review the prevalence of shadow equity in our data sample. In Section 4, we analyze the relationship between shadow equity and the pricing and leverage of CRE loans originations for stabilized properties. In Section 5 we investigate the relationship between shadow equity and loan performance for stabilized properties. We repeat this analysis analysis from Sections 4 and 5 for transitional properties in Section 6. In Section 7, we conclude.

2. DATA

We use supervisory data from Federal Reserve conducted stress tests, which contain loan-level information on the commercial real estate portfolios of the largest banks in the United States.[7] The data include construction and land development (CLD) loans, as well as loans secured by income producing properties. It is nearly comprehensive, as only loans with committed balances below $1 million are excluded from reporting.

The data include an array of information on banks' portfolio loans: the interest rate, committed exposure (drawn plus undrawn credit), loan balance, dates of origination and maturity, amortization (for example, interest-only versus fully amortizing), whether there is a prepayment penalty, and the interest rate variability type (fixed versus floating).[8] It also includes information on the property securing the loan: the appraised value, the type (for example, hotel versus retail), and geographic location at the five-digit zip code level. With the loan balance and appraised value, we construct the loan-to-value

[7] As part of their capital assessment and stress tests, banks file regulatory forms called the Y-14Q on a quarterly basis. The commercial real estate data can be found through Schedule H.2. The reporting panel consists of banks with consolidated assets of $100 billion or more. Our sample also includes some loans from banks with $50-$100 billion in assets due to the lower asset threshold before 2019. The data is at the facility-level, which can include multiple loans to the same entity, but most facilities contain only one loan, so we treat the data as loan-level.

[8] Interest rates and interest rate variability are not reported for fully undrawn loans. For these fields, we backfill information from the first instance non-zero or nonmissing values occur (typically the time of the first draw on the credit facility).

ratio. Given the interest rate and the dates of origination and maturity, we compute spreads over bank's costs of funds.[9]

The data also includes loan-level risk measures. First, banks provide a standardized version of their internal rating of the borrower for each loan. Banks have their own internal risk categorizations, but provide a mapping from these internal ratings to a common scale along the lines of what is used for bond ratings. Internal ratings can sometimes span multiple ratings on the common scale, so there is a mininum and maximum rating provided on the common scale. When constructing an indicator for whether a borrower is rated BBB+ or higher, we take the maximum rating. A subset of stress test banks are also "advanced approaches" institutions. These banks are required to report their estimates of loan probability of default and loss given default, the product of which is the expected loss of the loan. We incorporate this information in parts of our analysis, taking the average expected loss by credit rating at origination for non-advanced approaches banks, so as to not limit our sample.

Key to our analysis, banks also provide information on whether a loan has recourse and whether the loan is cross-collateralized.[10] As of September 2014, the recourse field indicates whether the loan has full, partial, or no recourse. Prior to that date, banks only indicated whether a loan had any form of recourse and did not distinguish between full and partial recourse. We label any loan that has partial or full recourse as having recourse.

We perform some cleaning of the data. We drop all loans with a negative or missing committed balance, all loans with an LTV greater than two or less than zero, all leveraged loans, all acquired loans, all loans to foreign borrowers, and all loans secured by properties outside the United States. We also create a more limited sample in which we drop any loan originated before 2012 (which is when standardized reporting began), any loan originated before the first quarter a given bank begins reporting, and any loan originated more than two quarters before it first appears in the data. Finally, we drop loans that have missing values for recourse, cross-collateralization, loan value, origination or maturity date, state code on the property, whether the loan is floating rate, and whether

[9]For floating rate loans, we use one-month LIBOR as the reference rate. For fixed-rate loans, we compute the maturity-matched swap rate. For loans with terms under two years, we linearly impute between one-month LIBOR and the the two-year swap rate. For terms above two years, we linearly impute between available swap rates. For floating rate loans that are undrawn at the time of first reporting, we use one-month LIBOR as of the reporting date rather than origination date as the reference rate.

[10]For cross-collateralized loans, banks report as the property value the total value of all cross-collateralized properties. For example, two cross-collateralized 80% LTV loans on two different $10 million dollar properties would be reported as loans of $8 million against $20 million in collateral. Since collateral is double-counted and loan amounts are not, we adjust property values and LTVs to only reflect the portion of the collateral applicable to that loan. Namely, the LTVs in the example loans would be treated as 80% rather than 40%.

the loan is the first lien on the property.

3. THE PREVALENCE OF RECOURSE AND CROSS-COLLATERALIZATION

We present summary statistics on some of the key variables from our cleaned sample of loans at origination—with finer detail conditional on recourse and cross-collateralization—in Table 1.

Table 1 is broken down by loans on stabilized and transitional properties (properties under construction or renovation), a distinction we make throughout our analysis.[11] Banks face significant uncertainty in valuing transitional properties, as the value of the property is highly dependent on the success of the investor in stabilizing the property. Delays or cost overruns for construction or renovation projects, or the inability to successfully lease-up a struggling property may undermine the performance of the loan. The higher risk of loans against transitional properties is reflected in their spreads, which are on average over 50 basis points higher than for loans on stabilized properties. The shorter terms reflect the fact that once the property is stabilized it is either sold or the loan is refinanced into a longer-term, lower-cost loan.

Though we highlight the differences between stabilized and transitional properties, recourse is fairly common across loans secured by either. For loans on stabilized properties, 77 percent have recourse, whereas 71 percent of loans on transitional properties have recourse. For both property types, we also observe differences between recourse and non-recourse loans. Most notably, recourse loans on stabilized properties are on average a quarter of the value of non-recourse loans. Recourse loans are smaller than non-recourse loans for transitional properties as well, though the difference is less stark. The patterns are not all consistent however. Recourse loans against stabilized properties have lower interest rates and similar LTVs to non-recourse loans. Yet for transitional properties, recourse loans have higher rates and higher LTVs.

Different from recourse, cross-collateralization is relatively rare, representing about 5 percent of loans against stabilized properties and 10 percent against transitional properties by number. Overall, cross-collateralized loans tend to have higher LTVs and higher spreads. For loans against stabilized properties, cross-collateralized loans are substantially larger on average.

Table 2 presents summary statistics for retail, industrial, lodging, office, and multifamily stabilized properties, revealing some significant differences.[12] For example, over

[11] We define the latter category as any construction and land development loan or any loan for which the reported property value is an estimate for once the property is completed or stabilized as opposed to the value being reported "as is."

[12] We provide parallel tables to Tables 1 and 2, breaking out recourse into whether it is full or partial

80 percent of loans on multifamily properties have recourse, whereas 69 percent of lodging loans have recourse. The pattern switches for cross-collateralization, with loans on lodging properties having the highest rate of cross-collateralization (12 percent) and those on multifamily properties having the lowest (2 percent).

The use of recourse and cross-collateralization differs substantially across lenders. Table A.3 in the Appendix presents the share of loans with recourse and cross-collateralization by lender quintile.[13] The top quintile of lenders have recourse on over 90 percent of loans against stabilized properties, while the lowest quintile of lenders only have recourse on 10 percent of such loans. Likewise, the use of cross-collateralization ranges from 1 percent to 27 percent from the lowest to the highest lender quintiles.

Given the emphasis in the residential mortgage literature on state differences in recourse laws, we also look at differences by state (quintile) in Table A.4.[14] Broadly, we find that differences in the use of recourse and cross-collateralization are less stark across states. Recourse shares for loans against stabilized properties range from 60 percent to 84 percent across state quintiles, while the use of cross-collateralization ranges from 3 percent to 13 percent.

4. DO LENDERS VALUE SHADOW EQUITY?

Qualitatively, the role of shadow equity—recourse and cross-collateralization—is straightforward: it should reduce borrowers' incentives to default when property values fall. This reduction in default risk should enable borrowers to either achieve more favorable loan pricing or be allowed greater risk along other dimensions, for example higher LTVs.

However, the quantitative significance of these credit enhancements is uncertain. Property investors tend to specialize in particular regions or property types, meaning that the value of an investor's other assets is likely to be highly correlated with the value of the subject property. By the time that a borrower is incentivized to default, equity in cross-collateralized properties may be erased and that borrower's net worth may fall such that recourse provides little value in the event of default. Moreover, costs and difficulties of achieving a deficiency judgment may substantially reduce the value banks place on recourse.

recourse in Tables A.1 and A.2 in the Appendix. Note that these appendix tables only use data from 2015-on, as 2015 is when the more detailed recourse statistics became available.

[13]We use quintiles so that multiple banks are in each bucket, thus preserving their anonymity.

[14]While laws allowing or preventing recourse on single family homes do not apply to commercial properties, there are still legal differences across states that can make it more or less difficult to obtain a deficiency judgment.

In order to investigate how banks value recourse and cross-collateralization, we study how these variables affect other underwriting characteristics of CRE loans. Specifically, we present estimates of how interest rate spreads on newly originated CRE loans vary based on the extent to which borrowers provide different forms of equity using the specification below:

$$r_{i,b,t} = \beta_1 \text{Recourse}_{i,b,t} + \beta_2 \text{Cross-Coll.}_{i,b,t} + \beta_3 \text{LTV}_{i,b,t} + \gamma' \text{X}_{i,b,t} + \tau_t + \eta_b + \varepsilon_{i,b,t}, \qquad (1)$$

where $r_{i,b,t}$ is the spread on loan i from bank b in origination year t, $\text{Recourse}_{i,b,t}$ indicates whether that loan has recourse, $\text{Cross-Coll.}_{i,b,t}$ indicates whether that loan is cross-collateralized, $\text{LTV}_{i,b,t}$ is the loan-to-value ratio and $\text{X}_{i,b,t}$ is a vector of controls. The regressions also include lender, state, property-type, and origination-year fixed effects. Our baseline set of controls includes the natural logarithm of the loan term, the natural logarithm of the committed balance at origination, and indicators for whether the loan is interest only, has a prepayment penalty, has a floating rate, and is the first lien on the property. In the regressions for transitional properties, we also include an indicator for whether the loan is a construction loan. In some specifications, we add controls for the expected loss on the loan, or an indicator for whether the loan is BBB+ rated or higher.

The key variables of interest are the LTV on the loan and the indicator variables for whether the loan offers recourse or cross-collateralization. Based on the logic that providing credit enhancements should reduce borrowers' incentives to default when the value of the subject property falls, we would expect $\beta_1 < 0$, $\beta_2 < 0$, and $\beta_3 > 0$.

In the first four columns of Table 3, we run these regressions for loans secured by stabilized properties. The first column presents results for the full sample of loans. The signs of the coefficients of interest are as expected. Rate spreads are about 13 basis points (bp) lower for loans with recourse or cross-collateralization. The coefficient on LTV implies that banks only lower interest rates by about 2bp for a 10 percentage point decrease in LTV. All three coefficients are significant at the 95 percent level.

The second column presents the same results but restricts the sample to loans where data is reported within two quarters of the origination date. The sample used in the first column is larger (around 126,000 observations compared to 90,000), as we include loans that were originated well before 2012 (as part of the reporting process, lenders were asked to report all loans in portfolio not just those originated in the reporting period).[15] Limiting the sample in this way reduces any concerns about selection bias due to missing

[15]The results in column 1 may be subject to selection bias for various reasons: shorter-term loans maturing before reporting, lower quality loans defaulting before reporting, loans prepaying, or loans getting modified so that terms at the time of reporting do not reflect origination values. To address the last concern, we drop loans where the reported date of origination differs from the earliest date of origination so as to exclude modified loans.

loans that were disposed of prior to data collection, so this is our preferred specification.

The results are broadly similar in the more restricted sample. LTV, recourse and cross-collateralization are all still significant at the 95 percent level. That said, the relative importance of each differs somewhat. We find stronger effects of recourse, with recourse loans having 21bp lower spreads. Effects for LTV and cross-collateralization are somewhat smaller: spreads on cross-collateralized loans are 11bp lower, and spreads on loans with a 10pp lower LTV are only about a basis point lower.

The specifications in the third and fourth columns add additional controls for risk based on banks' internal risk ratings for loans. Column 3 includes a dummy variable for whether the internal risk rating is equivalent to that of an investment grade credit (rated BBB or higher[16]), and column 4 includes the expected loss (probability of default times loss given default). The interpretation of the predicted effects of the difference equity measures is complicated in these specifications as a loan's LTV and other terms are presumably taken into account in banks' risk ratings. This specification thus tests whether banks offer lower spreads on loans with LTV, recourse, or cross-collateralization beyond the assessed effect of these variables on risk ratings. We see that the coefficients on recourse and cross-collateralization are little changed when controlling for risk. In contrast, LTV loses its significance and switches signs. Altogether, while banks offer lower spreads on loans with recourse and cross-collateralization, and they offer lower spreads on loans assessed as being lower risk, differences in recourse and cross-collateralization do not appear to significantly affect risk assessments, and thus these variables remain significant even controlling for risk.[17]

Of course, there are other benefits besides loan pricing that borrowers might realize from providing recourse or cross-collateralization. An investor with limited liquid assets might be unable to provide a down payment that a bank is comfortable with in order to make a loan. However, if the investor puts skin-in-the-game in other ways, banks may be more willing to make higher LTV loans.

Columns 5-8 provides evidence that recourse and cross-collateralization indeed function as substitutes for down payments. Each specification mirrors those from the first four columns of Table 3, except with LTV as the dependent variable instead of loan rate spreads. These regressions thus test whether loans that provide alternative forms of equity are allowed to have higher LTVs. Across the four specifications, we generally find that loans with recourse or cross-collateralization are allowed LTVs that are about 3 percentage points higher than loans without such enhancements.[18]

[16]Adding a full set of fixed effects for credit rating gave broadly similar results.

[17]In unreported regressions, we find that LTV has larger effects on banks' estimates of probability of default and expected losses than recourse or cross-collateralization.

[18]The predicted effect of cross-collateralization on LTV are somewhat higher in column 1, which does

Overall, the results indicate that banks value recourse and cross-collateralization. Loans with such shadow equity receive a combination of higher LTVs and lower interest rates. This is consistent with banks requiring a premium for loans for which investors have less equity, and investors who desire lower down payments responding with a combination of paying higher premiums and providing additional equity in the form of recourse and cross-collateralization to defray the costs.

5. DYNAMIC EFFECTS OF SHADOW EQUITY

The findings in Section 4 indicate that banks see value in recourse or cross-collateralization as a way to reduce credit risk. Loans with these features are, on average, allowed lower spreads and higher LTVs. The next question is whether the additional equity actually affects loan performance, particularly in periods of stress. In this section, we first document that CRE market stress during the COVID-19 period predominantly manifested itself in the form of higher modification rates rather than higher delinquency rates. We then investigate the roles that recourse and cross-collateralization play in determining stressed outcomes.

5.1. Why Modifications?

Table 4 presents summary statistics for how loan performance changed during the COVID-19 period. The key objects of interest are the quarterly rates at which loans are modified, distressed, or downgraded. Most modifications are defined by a reduction in required principal or interest payments, such as from a payment deferral, while the measure of distress predominantly reflects delinquency.[19]

The results show that distress is much less common than modifications. CRE loans against stabilized properties were modified at a rate of 6.2 percent per quarter during 2020, up from a rate of 2.3 percent pre-COVID. The escalation in modifications was particularly pronounced for lodging loans, for which the modification rate rose to 18 percent per quarter during COVID, compared to a 4.6 percent rate pre-COVID. Delinquency was comparatively rare, with the distress rate for bank CRE loans merely rising from 0.3 percent to 0.9 percent in 2020. Even loans backed by retail and lodging properties—which were affected dramatically by COVID-19—only had distress rates of 1 percent and 2.9

not drop loans that are reported with a lag.

[19]More specifically, a loan is considered modified if it switched from being amortizing to being interest-only or if the committed balance rises (indicating interest payments are tacked onto the loan balance). Loans are additionally considered to be modified if the maturity date is extended (outside of a pre-negotiated renewal), if the origination date for a loan id changes, or if the loan enters troubled debt restructuring. Loans are considered distressed if they are delinquent, in non-accrual, or are involuntarily liquidated. Loans are considered downgraded if the derived credit rating deteriorates in a given quarter.

percent, respectively, in 2020. These low distress rates stand in sharp contrast to loan performance in the CMBS market where overall delinquency rates surpassed 10 percent in June, including delinquency rates for lodging and retail-backed loans about double that average.

A likely reason for the comparably strong performance of bank CRE loans is that banks tend to modify loans before they become delinquent (Black et al., 2017). Given the high costs of foreclosure, and the limited contractual impediments to loan modifications relative to CMBS, banks are incentivized to work with borrowers to avoid default. These incentives for modification were particularly pronounced during the COVID-period as the stress was generally outside of borrowers' control, limiting the moral hazard concerns that can come with modifying troubled loans. Additionally, guidance from regulators encouraging banks to work with borrowers—and the accompanying leniency with regard to characterizing modifications as troubled debt restructurings—may have further encouraged banks to modify loans.[20] Thus, while the CRE market came under stress when measured by forward-looking measures (for example, the pace at which CRE loans were downgraded more than doubled to 6.4 percent per quarter), the availability of forbearance and modifications appear to have limited delinquency rates early in the pandemic.

5.2. Shadow Equity and Loan Performance

Having established that CRE market stress predominantly appeared in the form of modifications rather than delinquencies, we now study the role that recourse and cross-collateralization play in these dynamics. Borrowers with additional equity have less incentive to strategically default when property values decline, as they have other assets at stake (Ghent and Kudlyak, 2011). Thus even if one property does not generate enough income to service the debt on that property, the borrower may still make payments using returns from other assets. This mechanism would indicate that loans with these additional forms of equity would be less likely to require modification to stay current.

That said, a couple of other factors might dampen such effects. First, recourse and cross-collateralization may correlate with other unobserved risks that the enhancements were used to mitigate, making such loans riskier on average. Second, banks may be less willing to provide a borrower-friendly modification on a loan with credit enhancements, like recourse, as those enhancements could improve their recovery absent a modification.[21]

[20]The interagency statement from bank regulators regarding loan modifications is here: `https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200407a.htm`.

[21]How credit enhancements affect the incentive to modify in the event of distress is ambiguous. On one hand, enhancements may improve recovery absent modification, disincentivizing modifications. On the

Table 5 presents estimates of how recourse, cross-collateralization, and LTV relate to the likelihood of loans secured by stabilized properties getting modified, being distressed, or having their rating downgraded. These dependent variables are multiplied by 100, so the coefficients on recourse and cross-collateralization give estimates of the effect of these variables on the different performance variables in percentage points. Results are analyzed separately for the pre-COVID (2012-2019) and COVID (2020) period due to the different nature of stress during these times.[22] To provide a visual interpretation of the findings, in Figure 1, we show predicted effects of recourse and cross-collateralization on these outcomes on a quarter-by-quarter basis.[23]

The results in the first three columns demonstrate that recourse and cross-collateralization have little clear influence on loan performance in normal times. Recourse loans are less likely to get downgraded and cross-collateralized loans are more likely to be modified, but the credit enhancements otherwise appear to have little effect on loan performance. Although a couple of coefficients are statistically significant, the estimated effects are relatively small in magnitude compared to what was observed during COVID. Moreover, Figure 1 confirms the mixed nature of the results, with the coefficients frequently switching signs throughout the pre-COVID sample.

The last three columns of Table 5 present results for the COVID-19 period. The most stark finding is the large and statistically significant coefficient on recourse in predicting modifications. The results indicate that, on average, recourse loans were about 1.5 percentage points less likely to be modified per quarter than other loans.

More detail on the timing of this effect is shown in the top-left of Figure 1, where the predicted effect of recourse is determined by quarter-by-regressions. The figure shows that modification rates in the first quarter of 2020 (controlling for other characteristics) were somewhat higher for recourse loans than for non-recourse loans. However, by the second quarter—when modifications are more likely to reflect evaluations of particular loans instead of quickly implemented policies at the onset of the pandemic—we see much lower modification rates for recourse loans. Recourse is estimated as reducing the

other hand, banks may be more willing to modify loans if additional skin-in-the-game discourages the borrower from taking actions to the detriment of long term property values.

[22]Since we are interested in banks' decisions regarding particular loans, we omit from the analysis a few banks that modify over 30% of their CRE loans in 2020:Q1, as such modifications are more likely to reflect blanket policies rather than banks' assessments of the need to modify particular loans.

[23]Specifically, we regress each outcome variable on indicators for whether the loan has recourse or cross-collateralization, including the same controls and fixed effects from the table, separately for each quarter. For example, the top-left chart plots the expected modification rate in a quarter if every loan was recourse or if no loans had recourse, holding all other characteristics fixed. The gap between the lines is the quarterly estimate of the effect of recourse on loan modification. Other charts perform the same exercise except plotting differences in performance by cross-collateralization, or using one of the other outcome measures (distress or downgrades).

modification rate by 3.8 percentage points in 2020:Q2, with the effect declining to 2.1 percentage points in 2020:Q4. These differences are economically large relative to the average quarterly modification rates of 8.8 percent and 3.2 percent in these quarters, respectively. The results indicate that there would have been 7 percent fewer modifications in 2020 if all loans had recourse (all else equal), including 11 percent fewer in the second quarter. These total effects are particularly notable considering that only about a quarter of loans are non-recourse to begin with.

In addition, the results demonstrate that recourse loans are less likely to be downgraded, with the downgrade rate of recourse loans being about 76bp per quarter lower than for recourse loans. This result suggests that the slower place of modifications reflects less need for banks to provide accommodation to keep a loan performing rather than banks being less willing to modify recourse loans in general. This idea is similarly supported by the fact that recourse loans are not more likely to become distressed, despite receiving fewer modifications. If recourse loans received fewer modifications because banks were more willing to let troubled recourse loans default, we would expect more distress in recourse loans, something we do not find.

While the results indicate that recourse supports loan performance during the pandemic, we see no such benefit for cross-collateralization. Cross-collateralized loans are somewhat more likely to be modified than other loans, though the result is insignificant. However, the estimated effect declines relative to what was found during normal times, indicating that this effect might reflect higher rates of modifications for reasons besides banks preempting delinquency.[24] Cross-collateralized loans are also more likely to be distressed. However, this result may be due to the particular nature of the COVID-19 shock. The adverse effect of the pandemic for hotel and retail investors was incredibly broad-based, with retail establishments closing across the country and travel essentially coming to a halt. Cross-collateralization within such property types would provide little protection from such a systemic shock.

Table 6 demonstrates that the weak performance of cross-collateralized properties is indeed driven by hotel and retail loans. Cross-collateralized loans secured by these property types were significantly more likely to be downgraded or become distressed. The results indicate that banks may have required cross-collateralization to offset some other risks, however the widespread nature of the shock meant that the additional equity provided little benefit, resulting in cross-collateralized hotel and retail loans performing worse. Table A.5 shows that when hotel and retail loans are excluded, we do indeed see cross-collateralization associated with lower rates of distress and downgrades, though

[24]Cross-collateralization entails using a property securing another loan as additional collateral. The existence of multiple loans may indicate a more extensive relationship with a borrower, facilitating more frequent modifications independent of performance considerations.

the results are statistically insignificant.

As a final exercise, we analyze how recourse and cross-collateralization affect the types of modifications that banks provide for stabilized loans. In Table 7, we show that, in addition to receiving fewer modifications during the COVID-period, recourse loans also tend to receive more minor modifications. Though recourse loans are more likely to have their amortization switch to being interest-only, they are almost 5 percentage points less likely to have a modification involve an increase in committed balances. Thus while banks frequently allow borrowers with recourse to cease principal payments, banks appear less likely to defer interest payments. Regarding cross-collateralization, we see little difference in modification types for cross-collateralized loans, just as we saw little difference for modification frequency.

Overall, the performance of loans with recourse or cross-collateralization during the COVID-19 period is broadly consistent with the findings in Section 4. Namely, these enhancements appear to reduce risks in stabilized properties, consistent with the lower rate spreads at origination on such loans. However, this result comes with the caveat that the widespread stress in the market seems to have diminished the benefit of cross-collateralization.

6. TRANSITIONAL PROPERTIES

In Sections 4 and 5, we limited our analysis to loans secured by stabilized properties. In this section, we repeat those exercises for transitional loans.

6.1. The Value of Shadow Equity for Transitional Loans

Columns 1-4 of Table 8 present the spreads regressions described in Section 4. The controls are the same as in Table 3, except each specification additionally includes an indicator for whether the loan is a construction loan. Relative to the results for stabilized properties, LTV is typically found to have more significant effects on pricing, however, banks no longer provide lower spreads for recourse or cross-collateralized loans. Across the four specifications, the results indicate that a 10 percentage point decrease in LTV reduces rate spreads between 1 and 2 basis points. Recourse is estimated as *increasing* spreads by 12 or 13 basis points for loans secured by transitional properties, though the estimates are smaller when controlling for risk ratings in columns 7 and 8. The coefficients on cross-collateralization are small and statistically insignificant in all specifications.

There are a few possible, explanations for the different findings for transitional properties compared to stabilized properties. First, shadow equity could provide less value

for transitional properties. Construction and redevelopment are particularly risky and cyclical activities. If the outside assets of the borrowers taking out these loans are other construction or redevelopment projects, banks may believe that there will be little equity left in stressed scenarios. Second, the short terms on construction and redevelopment loans make origination fees comparatively important relative to interest rates. It is thus possible that pricing benefits for loans with more shadow equity are reflected in (unreported) fees rather than interest rates.

A third explanation is that shadow equity is used to offset other unobserved risks, biasing estimates of how these characteristics affect loan pricing. If this bias is more pronounced for transitional properties, this could explain the difference in the pricing of recourse for stabilized and transitional properties. Such an explanation is consistent with the smaller estimates we find when controlling for risk ratings.

Columns 5-8 present the results from the LTV regressions for loans against transitional properties, again with the same controls as in Table 3 plus an additional control for whether the loan is a construction loan. Here, the roles of recourse and cross-collateralization are more consistent with those for stabilized properties. The estimates in column 5 imply that LTVs for loans against transitional properties are about 3 percentage points higher for recourse loans and 7 to 8 percentage points higher for cross-collateralized loans. The coefficients fall modestly for recourse and rise modestly for cross-collateralization when restricting the sample to loans with reporting dates close to origination dates in column 6, or when including risk controls in columns 7 and 8.

Altogether, the results indicate that recourse and cross-collateralization are used to offset other risks for loans secured by transitional properties. For one, loans with these enhancements have significantly higher LTVs. Additionally, recourse appears to correlate with other *unobserved* risk factors, as such loans receive less favorable pricing than non-recourse loans. Controlling for risk ratings reduces the predicted effect of recourse on loan rates by over half, consistent with this premium reflecting unobserved risks.

6.2. Dynamic Effects of Shadow Equity for Transitional Properties

Table 9 repeats the exercises described in Section 5, but for transitional properties. In Figure 2, we provide the visual counterpart to these regressions (following what was done for Figure 1). The first three columns of the table show that there is no clear relationship between shadow equity and loan performance in normal times. Recourse loans are more likely to be modified but less likely to be downgraded. Cross-collateralized loans are less likely to be modified or downgraded. Neither variable significantly relates to distress. Furthermore, Figure 2 shows that there is little consistency over time in how the two forms of shadow equity relate to loan performance in the pre-COVID period.

The results in the last three columns indicate that recourse loans performed somewhat worse during COVID-19, while cross-collateralized loans performed somewhat better. Specifically, recourse is associated with higher rates of modification and distress, while cross-collateralization is associated with the opposite. The coefficient on downgrades is insignificant for both recourse and cross-collateralization.

Figure 2 provides more clarity on the timing with which performance differs based on whether loans have recourse or cross collateralization. We can see that the spike in modifications in 2020:Q2 was fairly similar for loans with and without credit enhancements. The higher modification rate for recourse loans is entirely driven by the first quarter, and is the result of a pattern that predated COVID. The lower modification rate for cross-collateralized loans is predominately driven by the third and fourth quarters.

Differences in patterns for distress rates are more visually striking. After having fairly similar distress rates over 2019, the performance of recourse loans starts to deteriorate notably relative to non-recourse loans in 2020:Q1 and recourse loans continue to underperform through-out 2020. Cross-collateralized loans similarly outperform other loans throughout the pandemic, thought the difference narrowed in the fourth quarter.

Overall, the results suggest that cross-collateralization is associated with better performance for transitional loans, while recourse is associated with worse performance. These results thus parallel the findings from Table 8, which indicated that recourse loans against transitional properties have riskier unobserved characteristics. The higher distress rate for recourse loans suggests that these risks affected loan performance when the market came under stress in 2020.

7. CONCLUSION

We examine the value of two forms of shadow equity—recourse and cross-collateralization—in CRE loan contracts. We show that shadow equity acts as an important substitute for traditional equity, enabling property investors to borrow at higher LTVs than they could otherwise. The availability of shadow equity also reduces loan rate spreads for mortgages on stabilized properties, suggesting banks value the ability for shadow equity to reduce debt overhang and the risk of strategic default. Consistent with shadow equity providing value to lenders in times of stress, we observe smaller increases in loan modifications for loans with recourse or cross-collateralization during the COVID-19 pandemic. However, the wide-spread nature of the COVID-shock appears to have eroded some of the benefits of cross-collateralization for the most adversely affected property types.

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	Loans (#)	Share of #	Share of $	Orig. Value (Mil.$)	Orig. Amount (Mil.$)	Term (Years)	LTV (%)	Rate Spread (bps)
Stabilized								
Overall	125,605	100	100	16	8	14	60	230
Recourse	96,816	77	47	9	5	16	60	228
No Recourse	28,789	23	53	39	18	9	60	238
X-Collateralized	6,035	5	7	27	12	6	66	250
Not X-Collateralized	119,570	95	93	15	8	15	60	229
Transitional								
Overall	101,719	100	100	19	10	7	66	285
Recourse	72,063	71	67	18	10	7	68	291
No Recourse	29,656	29	33	23	11	8	63	271
X-Collateralized	10,164	10	9	17	10	5	70	299
Not X-Collateralized	91,555	90	91	19	10	7	66	284

Table 1: Summary Statistics for Stabilized and Transitional Properties.
Notes: This table presents summary statistics on the stabilized and transitional samples used in our empirical analysis, also disaggregated by recourse and cross-collateralization. Values are as of loan origination. There are about 10 percent of loans that do not fit into one of these property types (for example, hospitals), the summary stats for which are not shown.
Source: Authors' calculations using Y-14 CRE Schedule.

	Loans (#)	Share of #	Share of $	Orig. Value (Mil.$)	Orig. Amount (Mil.$)	Price Per[1]	Term (Years)	LTV (%)	Rate Spread (bps)
Retail									
Overall	20,200	100	100	16	7	262	7	61	246
Recourse	15,373	76	53	9	5	257	7	61	244
No Recourse	4,827	24	47	38	15	281	8	60	250
X-Collateralized	1,297	6	8	23	9	274	6	66	254
Not X-Collateralized	18,903	94	92	16	7	261	7	61	245
Industrial									
Overall	12,381	100	100	12	6	118	8	63	258
Recourse	9,685	78	51	7	4	116	8	64	261
No Recourse	2,696	22	49	29	15	124	7	63	249
X-Collateralized	808	7	10	16	10	164	7	70	255
Not X-Collateralized	11,573	93	90	12	6	115	8	63	259
Lodging									
Overall	4,235	100	100	36	18	99,447	7	60	291
Recourse	2,912	69	44	20	11	96,249	6	61	281
No Recourse	1,323	31	56	71	32	108,242	8	58	312
X-Collateralized	521	12	9	41	13	168,231	6	62	281
Not X-Collateralized	3,714	88	91	35	18	91,921	7	59	293
Office									
Overall	17,587	100	100	30	15	221	7	64	246
Recourse	12,573	71	34	13	7	217	7	65	249
No Recourse	5,014	29	66	74	34	236	7	62	239
X-Collateralized	1,314	7	7	37	14	312	6	68	242
Not X-Collateralized	16,273	93	93	30	15	216	7	63	246
Multifamily									
Overall	56,782	100	100	11	6	118,989	22	57	200
Recourse	45,792	81	52	7	4	116,576	25	56	196
No Recourse	10,990	19	48	26	14	125,047	11	60	215
X-Collateralized	993	2	5	29	15	117,199	6	65	226
Not X-Collateralized	55,789	98	95	10	6	119,070	22	57	199

[1] Values are per square foot for retail, industrial and office properties; per room for lodging; and per unit for multifamily.

Table 2: Summary Statistics for Stabilized Properties by Property Type. *Notes:* This table presents summary statistics on the largest five stabilized property types used in our empirical analysis, also disaggregated by recourse and cross-collateralization. Values are as of loan origination. Loan shares, values, and loan balances are unweighted averages. *Source:* Authors' calculations using Y-14 CRE Schedule.

	Effect on Rate Spreads (percentage points)				Effect on LTV (percentage points)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Recourse	-0.135***	-0.207***	-0.197***	-0.195***	3.303***	2.911***	2.875***	2.843***
	(0.0477)	(0.0309)	(0.0278)	(0.0281)	(0.554)	(0.850)	(0.888)	(0.888)
Cross-Collateralized	-0.129***	-0.109**	-0.100*	-0.106**	4.789***	3.093**	2.992**	2.905**
	(0.0417)	(0.0524)	(0.0514)	(0.0514)	(1.206)	(1.422)	(1.423)	(1.420)
LTV	0.00206***	0.000796**	-0.000650	-0.000891*				
	(0.000696)	(0.000391)	(0.000554)	(0.000484)				
Interest Rate Spread					0.977**	0.528**	-0.311	-0.446*
					(0.396)	(0.244)	(0.284)	(0.243)
Borrower Rated BBB+			-0.201***	-0.160***			-9.311***	-8.939***
			(0.0537)	(0.0540)			(2.123)	(2.165)
Expected Loss				0.0951***				0.882***
				(0.0136)				(0.195)
ln(Origination Amount)	-0.199***	-0.169***	-0.167***	-0.164***	3.072***	3.026***	2.810***	2.808***
	(0.0195)	(0.00940)	(0.00881)	(0.00858)	(0.292)	(0.399)	(0.316)	(0.322)
ln(Maturity in Years)	-0.177***	-0.269***	-0.260***	-0.243***	-0.298	0.279	0.448	0.577*
	(0.0517)	(0.0302)	(0.0300)	(0.0263)	(0.424)	(0.283)	(0.368)	(0.317)
IO Loan	-0.0562	-0.158	-0.165	-0.160	-1.637**	-2.475***	-2.784***	-2.776***
	(0.0798)	(0.118)	(0.112)	(0.112)	(0.661)	(0.672)	(0.835)	(0.843)
Floating Rate	0.600*	0.550	0.571	0.577	-1.682***	-0.921***	0.360	0.470
	(0.353)	(0.367)	(0.360)	(0.357)	(0.262)	(0.233)	(0.510)	(0.492)
First Lien	-0.235***	-0.345***	-0.301***	-0.295***	12.14***	13.85***	12.77***	12.66***
	(0.0684)	(0.0913)	(0.0958)	(0.0924)	(1.818)	(2.270)	(2.339)	(2.332)
Prepayment Penalty	0.109**	0.164**	0.160**	0.166**				
	(0.0480)	(0.0682)	(0.0735)	(0.0719)				
Industrial	-0.00469	0.0917	0.0889	0.0913	-1.061*	-1.756***	-1.891***	-1.864***
	(0.0436)	(0.0640)	(0.0622)	(0.0628)	(0.544)	(0.508)	(0.545)	(0.537)
Lodging	0.420***	0.459***	0.435***	0.430***	-8.813***	-8.068***	-8.261***	-8.285***
	(0.0736)	(0.0543)	(0.0541)	(0.0572)	(0.768)	(0.761)	(0.805)	(0.813)
Office	0.0331	0.113**	0.107**	0.108**	-0.926	-1.747*	-1.912*	-1.896*
	(0.0485)	(0.0521)	(0.0503)	(0.0502)	(0.789)	(0.887)	(0.982)	(0.978)
Retail	0.0104	0.0790	0.0781	0.0807	-3.062***	-3.200***	-3.153***	-3.123***
	(0.0370)	(0.0586)	(0.0569)	(0.0568)	(0.633)	(0.552)	(0.562)	(0.557)
N	125,605	89,915	89,207	89,096	125,605	89,915	89,207	89,096
R2	0.40	0.42	0.43	0.44	0.18	0.17	0.23	0.23
Lender Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 3: Relation to Rate Spreads and LTV for Loans on Stabilized Properties. *Notes:* Columns 1–4 presents coefficients from regressing loan rate spreads (with respect to the maturity-matched swap rates for fixed rate loans and one-month dollar LIBOR for floating rate loans) on LTV, indicators for whether the loan has recourse or is cross-collateralized, and controls. Similarly, columns 5–8 contain coefficients from similar regressions with LTV as the dependent variable. The sample is composed of loans on stabilized properties. In Columns (2)-(4) and (6)-(8), we drop loans originated more than two quarters before the first reporting date. The omitted property type is multifamily. There are also some property type fixed effects for properties outside of industrial, lodging, office, and retail that are not reported. Standard errors, in parentheses, are clustered at the bank level. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively. *Source:* Authors' calculations using the Y-14 CRE schedule.

	Observations (#)	Downgraded (#)	Distressed (#)	Modified (#)	Downgraded (bps)	Distressed (bps)	Modified (bps)
Stabilized							
Pre-Covid	475,067	13,468	1,614	10,752	283	34	226
Covid	80,779	5,138	748	4,982	636	93	617
Retail							
Pre-Covid	192,137	5,750	692	5,549	299	36	289
Covid	33,000	2,756	335	2,473	835	102	749
Industrial							
Pre-Covid	85,779	2,319	386	3,033	270	45	354
Covid	14,795	538	107	1,203	364	72	813
Lodging							
Pre-Covid	48,809	1,652	268	2,232	338	55	457
Covid	7,803	1,848	224	1,409	2,368	287	1,806
Office							
Pre-Covid	164,009	5,086	786	5,835	310	48	356
Covid	25,607	1,250	190	2,271	488	74	887
Multifamily							
Pre-Covid	252,978	7,541	948	9,889	298	37	391
Covid	41,685	2,353	302	3,659	564	72	878
Transitional							
Pre-Covid	453,264	14,288	2,714	28,097	315	60	620
Covid	68,531	4,924	749	9,514	719	109	1,388

Table 4: Counts and Shares of Loans that are Distressed, Downgraded, or Modified. *Notes:* This table presents loan-quarter observation counts of all loans, and counts and shares of those loans that are distressed, downgraded, or modified for the stabilized and transitional samples used in our empirical analysis, separated by the pre-Covid (2012-2019) and Covid (2020) time periods. We also present such statistics for the largest five stabilized property types used in our empirical analysis. Statistics with units in bps are the share of loan-quarter observations out of the total multiplied by 100.
Source: Authors' calculations using the Y-14 CRE Schedule.

	Pre-COVID			COVID		
	Modified	Distressed	Downgraded	Modified	Distressed	Downgraded
	(1)	(2)	(3)	(4)	(5)	(6)
Recourse	-0.00761	0.0516	-0.210***	-1.536***	0.0127	-0.762***
	(0.0817)	(0.0401)	(0.0696)	(0.343)	(0.149)	(0.260)
Cross-Collateralized	0.387***	0.0101	0.0506	0.144	0.368*	0.243
	(0.113)	(0.0533)	(0.0934)	(0.357)	(0.191)	(0.322)
LTV	0.909***	0.119	0.342**	4.772***	1.538***	1.049**
	(0.179)	(0.0990)	(0.147)	(0.549)	(0.384)	(0.500)
N	475,067	475,067	475,067	80,779	80,779	80,779
R2	0.04	0.02	0.02	0.08	0.03	0.08
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y
Lender Fixed Effects	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y
Property Type Fixed Effects	Y	Y	Y	Y	Y	Y

Table 5: Dynamic Regressions for Loans on Stabilized Properties. *Notes:* For the sample of stabilized properties, each column presents coefficients from regressing whether the loan is modified, distressed, or downgraded on LTV, indicators for whether the loan has recourse or is cross-collateralized, and controls. The full list of controls is shown in Table 3. Columns (1)–(3) only include loan-quarter observations from pre-2020, while columns (4)–(6) only include loan-quarter observations from 2020:Q1 to 2021:Q1. Standard errors are clustered by loan. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculations using the Y-14 CRE Schedule.

	Pre-COVID			COVID		
	Modified	Distressed	Downgraded	Modified	Distressed	Downgraded
	(1)	(2)	(3)	(4)	(5)	(6)
Recourse	-0.122	0.0455	-0.386***	-0.922	-0.375	-0.646
	(0.145)	(0.0564)	(0.130)	(0.643)	(0.337)	(0.526)
Cross-Collateralized	0.120	0.120	0.215	0.0620	1.547***	1.778***
	(0.191)	(0.0980)	(0.173)	(0.648)	(0.441)	(0.642)
LTV	1.165***	0.276	0.296	4.053***	3.722***	-1.179
	(0.330)	(0.171)	(0.294)	(1.128)	(0.935)	(1.064)
N	149,570	149,570	149,570	27,114	27,114	27,114
R2	0.04	0.01	0.02	0.09	0.04	0.11
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y
Lender Fixed Effects	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y
Property Type Fixed Effects	Y	Y	Y	Y	Y	Y

Table 6: Dynamic Regressions For Loans on Stabilized Hotel and Retail Properties. *Notes:* For only hotel and retail stabilized properties, each column presents coefficients from regressing whether the loan is modified, distressed, or downgraded on LTV, indicators for whether the loan has recourse or is cross-collateralized, and controls. The full list of controls is shown in Table 3. Columns (1)–(3) only include loan-quarter observations from pre-2020, while columns (4)–(6) only include loan-quarter observations from 2020:Q1 to 2021:Q1. Standard errors are clustered by loan. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculations using the Y-14 CRE Schedule.

	Pre-COVID				COVID			
	Extension (1)	CB Up (2)	To IO (3)	TDR (4)	Extension (5)	CB Up (6)	To IO (7)	TDR (8)
Recourse	0.997	-0.231	0.288	-0.00306	0.0655	-4.899***	7.818***	0.0787
	(1.091)	(1.138)	(0.779)	(0.280)	(1.500)	(1.611)	(1.143)	(0.276)
Cross-Collateralized	-0.905	3.795**	-1.532*	-0.197	2.591	-1.248	1.620	0.188
	(1.463)	(1.584)	(0.884)	(0.407)	(1.964)	(2.158)	(1.407)	(0.442)
LTV	-10.50***	16.56***	-1.029	3.569***	-13.73***	15.65***	-0.345	1.217
	(2.351)	(2.520)	(1.584)	(0.803)	(3.877)	(3.990)	(2.451)	(1.093)
N	10,752	10,752	10,752	10,752	4,982	4,982	4,982	4,982
R2	0.41	0.29	0.42	0.14	0.46	0.45	0.56	0.09
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Lender Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Property Type Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 7: Types of Loan Modification. *Note:* Regressions are linear probability models where the sample is limited to loans that received a modification and the dependent variable is the type of modification received. CB stands for committed balance. A decline in committed balance is limited to loans that are interest only. The data is split into Pre-COVID (pre-2020) and COVID (2020) samples to allow all coefficients to vary across the two time periods.
Source: Authors' calculations using the Y-14 H.2 Schedule.

	Effect on Rate Spreads (percentage points)				Effect on LTV (percentage points)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Recourse	0.125**	0.140**	0.0506*	0.0580**	3.197***	2.262**	2.798***	2.887***
	(0.0526)	(0.0599)	(0.0250)	(0.0256)	(0.931)	(0.934)	(0.991)	(0.989)
Cross-Collateralized	0.0274	0.0673	0.0316	0.0257	7.177***	7.663***	7.818***	7.739***
	(0.0332)	(0.0436)	(0.0371)	(0.0368)	(1.762)	(1.918)	(1.827)	(1.852)
LTV	0.00193***	0.00161**	0.00135**	0.00115**				
	(0.000573)	(0.000664)	(0.000583)	(0.000565)				
Interest Rate Spread					1.161***	1.110**	0.991**	0.851*
					(0.346)	(0.488)	(0.452)	(0.439)
Borrower Rated BBB+			-0.259***	-0.236***			-4.276***	-4.011***
			(0.0510)	(0.0521)			(0.918)	(1.017)
Expected Loss				0.0579***				0.780**
				(0.0191)				(0.337)
ln(Origination Amount)	-0.175***	-0.146***	-0.155***	-0.151***	1.651***	0.385	0.513	0.526
	(0.0170)	(0.0204)	(0.0200)	(0.0198)	(0.428)	(0.522)	(0.531)	(0.526)
ln(Maturity in Years)	-0.226***	-0.266***	-0.221***	-0.204***	-0.404	0.590	0.773	0.951
	(0.0463)	(0.0460)	(0.0448)	(0.0385)	(0.614)	(0.701)	(0.807)	(0.783)
IO Loan	-0.0576	-0.00228	-0.0427	-0.0349	-0.863*	-1.553*	-0.748	-0.650
	(0.0851)	(0.0465)	(0.0418)	(0.0417)	(0.500)	(0.810)	(0.930)	(0.955)
Floating Rate	0.464***	0.361***	0.329***	0.339***	-5.091***	-4.415***	-4.293***	-4.093***
	(0.0937)	(0.105)	(0.0979)	(0.0980)	(1.205)	(0.973)	(0.983)	(0.963)
First Lien	-0.168**	-0.109	-0.0995	-0.0998	9.494***	11.67***	11.71***	11.70***
	(0.0626)	(0.0745)	(0.0700)	(0.0713)	(2.134)	(3.210)	(3.144)	(3.106)
Prepayment Penalty	0.0816	0.119*	0.0764	0.0760				
	(0.0695)	(0.0701)	(0.0649)	(0.0643)				
Construction Loan	0.170***	0.220***	0.257***	0.254***	4.507***	5.464***	4.406***	4.396***
	(0.0511)	(0.0584)	(0.0513)	(0.0506)	(0.977)	(0.950)	(0.899)	(0.893)
Industrial	0.0202	0.109	0.0935	0.0914	3.403***	1.168	1.379	1.324
	(0.0452)	(0.0729)	(0.0655)	(0.0654)	(1.088)	(1.136)	(1.050)	(1.043)
Lodging	0.350***	0.435***	0.425***	0.416***	-5.486***	-6.326***	-6.452***	-6.499***
	(0.0894)	(0.0830)	(0.0780)	(0.0786)	(0.824)	(0.810)	(0.744)	(0.722)
Office	0.0349	0.128*	0.118*	0.112*	4.094***	2.776***	2.985***	2.871***
	(0.0556)	(0.0648)	(0.0592)	(0.0591)	(0.958)	(0.967)	(0.908)	(0.891)
Retail	-0.0222	0.0220	0.0220	0.0186	2.068**	0.799	1.122	1.030
	(0.0417)	(0.0415)	(0.0390)	(0.0389)	(0.988)	(1.070)	(0.977)	(0.954)
N	101,719	62,160	57,828	57,477	101,719	62,160	57,828	57,477
R2	0.31	0.40	0.38	0.38	0.12	0.13	0.13	0.13
Lender Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 8: Relation to Rate Spreads and LTV for Loans on Transitional Properties. *Notes:* Columns 1–4 presents coefficients from regressing loan rate spreads (with respect to the maturity-matched swap rates for fixed rate loans and one-month dollar LIBOR for floating rate loans) on LTV, indicators for whether the loan has recourse or is cross-collateralized, and controls. Similarly, columns 5–8 contain coefficients from similar regressions with LTV as the dependent variable. The sample is composed of loans on transitional properties. In Columns (2)-(4) and (6)-(8), we drop loans originated more than two quarters before the first reporting date. The omitted property type is multifamily. There are also some property type fixed effects for properties outside of industrial, lodging, office, and retail that are not reported. Standard errors, in parentheses, are clustered at the bank level. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculations using the Y-14 CRE schedule.

	Pre-COVID			COVID		
	Modified	Distressed	Downgraded	Modified	Distressed	Downgraded
	(1)	(2)	(3)	(4)	(5)	(6)
Recourse	0.363***	0.0231	-0.191***	0.565	0.270**	-0.0431
	(0.137)	(0.0520)	(0.0696)	(0.415)	(0.115)	(0.248)
Cross-Collateralized	-0.694***	0.0766	-0.214***	-0.997**	-0.384**	0.438
	(0.147)	(0.0755)	(0.0813)	(0.476)	(0.159)	(0.293)
LTV	2.314***	0.114	-0.00968	4.044***	0.628**	-0.438
	(0.245)	(0.117)	(0.129)	(0.746)	(0.313)	(0.435)
N	453,264	453,264	453,264	68,531	68,531	68,531
R2	0.07	0.02	0.02	0.17	0.02	0.08
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y
Lender Fixed Effects	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y
Property Type Fixed Effects	Y	Y	Y	Y	Y	Y

Table 9: Dynamic Regressions For Loans on Transitional Properties. *Notes:* For the sample of transitional properties, each column presents coefficients from regressing whether the loan is modified, distressed, or downgraded on LTV, indicators for whether the loan has recourse or is cross-collateralized, and controls. The full list of controls is shown in Table 3. Columns (1)–(3) only include loan-quarter observations from pre-2020, while columns (4)–(6) only include loan-quarter observations from 2020:Q1 to 2021:Q1. Standard errors are clustered by loan. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculations using the Y-14 CRE Schedule.

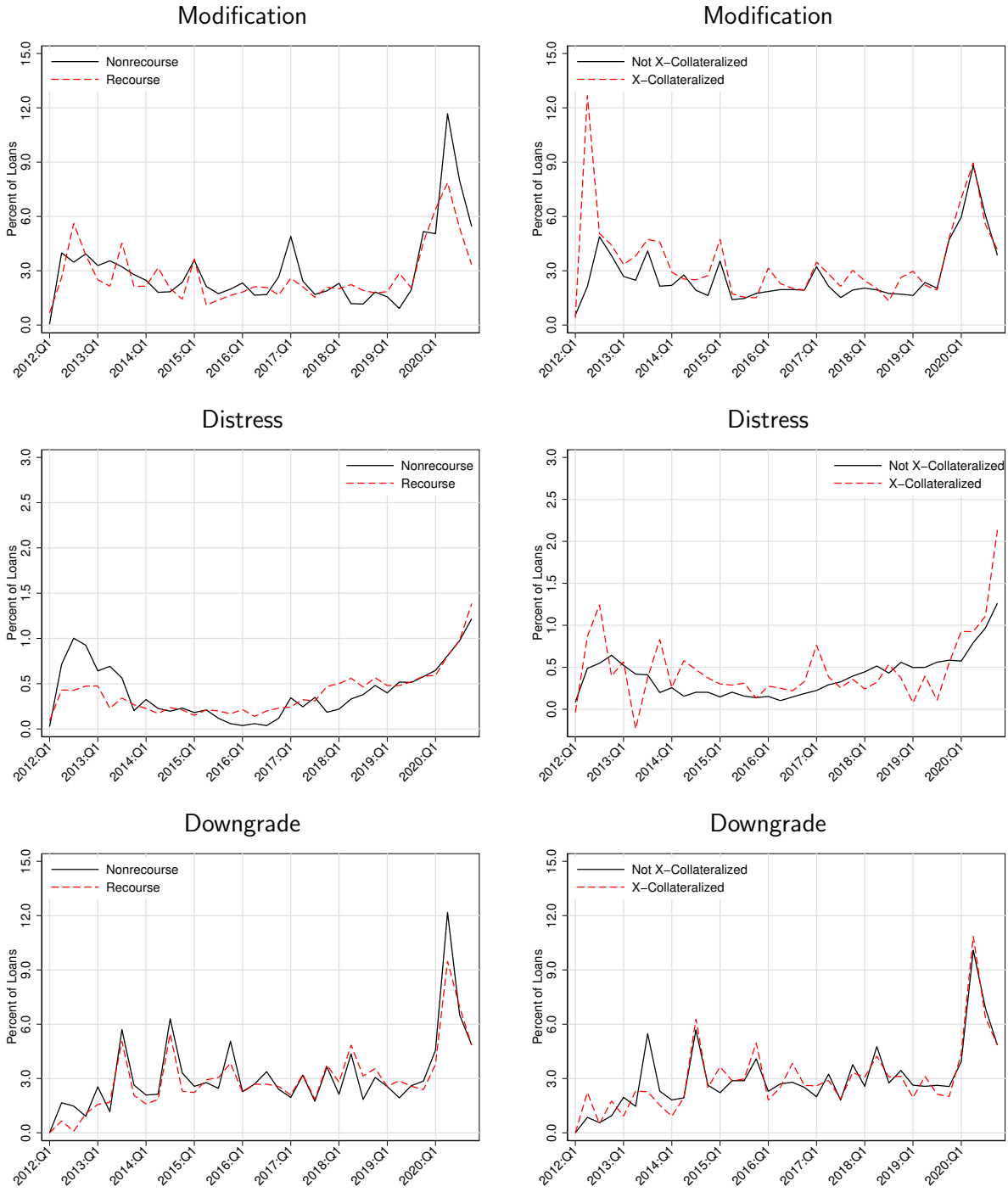

Figure 1: Average Predicted Effects for Loans on Stabilized Properties. *Notes:* For the sample of stabilized properties, we show predicted values of regressing one of whether the loan is modified, distressed, or downgraded on whether the loan is recourse or cross-collateralized with controls and the fixed effects shown in Tables 5-8, run on a quarter-by-quarter basis. The full list of controls is shown in Table 3.
Source: Authors' calculations using the Y-14 CRE Schedule.

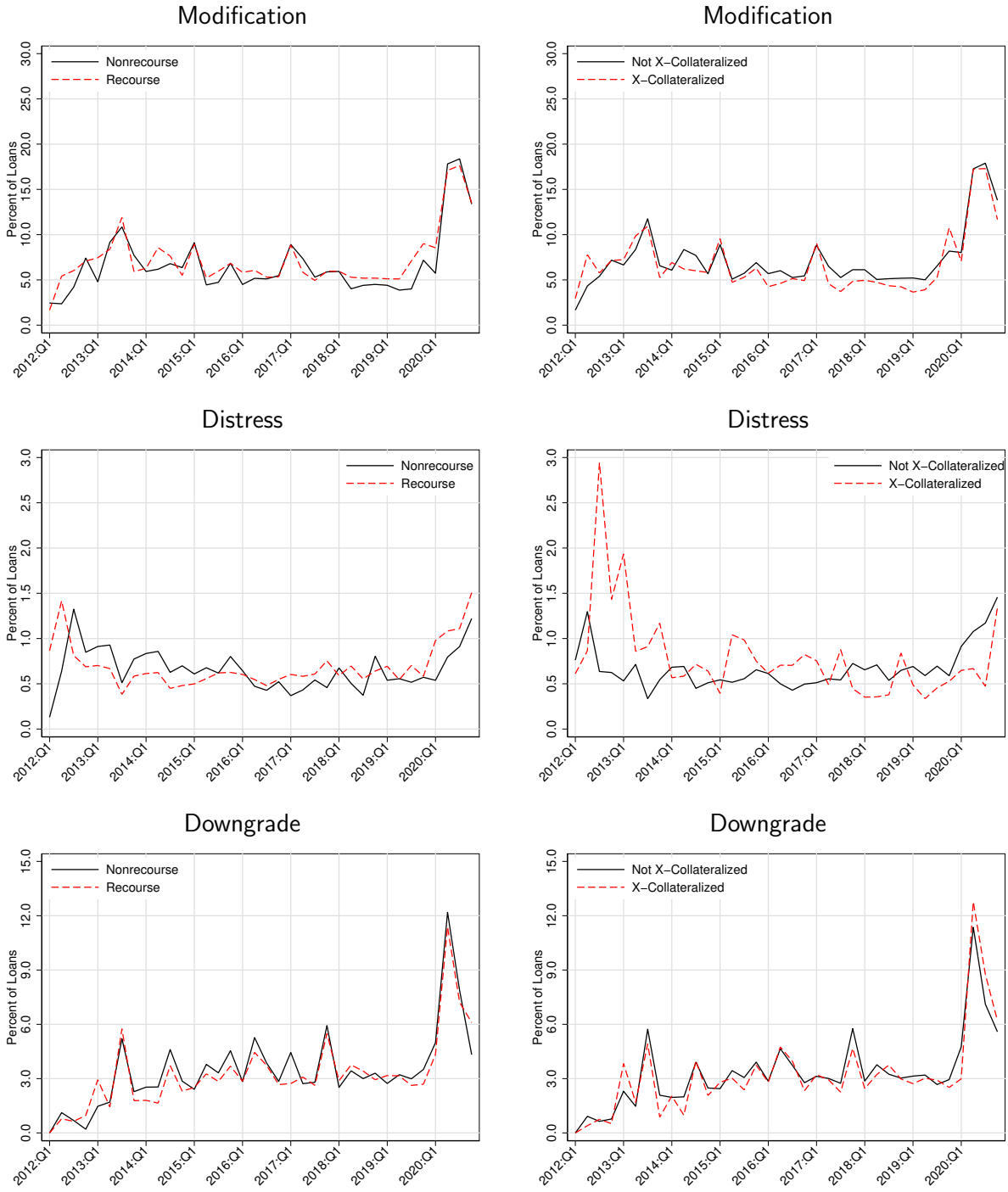

Figure 2: Average Predicted Effects for Loans on Transitional Properties. *Notes:* For the sample of transitional properties, we show predicted values of regressing one of whether the loan is modified, distressed, or downgraded on whether the loan is recourse or cross-collateralized with controls and the fixed effects shown in Tables 5-8, run on a quarter-by-quarter basis. The full list of controls is shown in Table 3.
Source: Authors' calculations using the Y-14 CRE Schedule.

A. SUPPLEMENTAL TABLES

This section includes supplemental tables referenced in the text.

	Loans (#)	Share of #	Share of $	Orig. Value (Mil.$)	Orig. Amount (Mil.$)	Term (Years)	LTV (%)	Rate Spread (bps)
Stabilized								
Overall	72,092	100	100	22	11	16	55	202
Full Recourse	38,915	54	25	10	5	15	55	207
Partial Recourse	15,863	22	15	14	7	22	52	184
No Recourse	17,314	24	60	57	27	10	58	210
Not Yet Stabilized								
Overall	61,266	100	100	26	13	8	64	264
Full Recourse	33,740	55	38	16	9	8	65	274
Partial Recourse	7,652	12	26	55	26	4	59	258
No Recourse	19,874	32	37	31	15	11	63	247

Table A.1: Full and Partial Recourse Summary Statistics for Loans on Stabilized and Transitional Properties. *Notes:* This table presents summary statistics for loans on stabilized and transitional properties disaggregated by full vs. partial recourse. All loans are originated in 2015 or later. Values are as of loan origination. Loan shares, values, and loan balances are unweighted averages.
Source: Authors' calculations using Y-14 CRE Schedule.

	Loans (#)	Share of #	Share of $	Orig. Value (Mil.$)	Orig. Amount (Mil.$)	Price Per[1]	Maturity (Years)	LTV (%)	Rate Spread (bps)
Retail									
Overall	11,538	100	100	22	9	328	8	56	218
Full Recourse	7,549	65	33	9	5	309	7	56	219
Partial Recourse	1,546	13	15	17	10	323	8	57	213
No Recourse	2,443	21	53	62	23	391	8	57	220
Industrial									
Overall	5,421	100	100	27	13	112	8	56	221
Full Recourse	3,501	65	24	9	5	116	7	56	223
Partial Recourse	803	15	14	30	12	57	9	54	220
No Recourse	1,117	21	63	83	39	122	7	57	213
Lodging									
Overall	1,972	100	100	53	26	172,902	7	55	250
Full Recourse	1,056	54	22	19	10	127,379	7	54	240
Partial Recourse	195	10	10	43	26	159,983	6	58	253
No Recourse	721	37	68	105	47	277,483	7	56	264
Office									
Overall	9,050	100	100	46	22	309	7	59	218
Full Recourse	5,236	58	20	14	7	306	7	59	220
Partial Recourse	1,060	12	9	30	16	229	8	57	215
No Recourse	2,754	30	71	112	50	369	6	58	214
Multifamily									
Overall	38,162	100	100	13	7	176,183	23	54	185
Full Recourse	18,161	48	24	7	4	149,070	24	54	188
Partial Recourse	11,787	31	22	10	5	214,752	27	51	172
No Recourse	8,214	22	53	31	18	221,799	13	59	196

[1] Values are per square foot for retail, industrial and office properties; per room for lodging; and per unit for multifamily.

Table A.2: Full and Partial Recourse Summary Statistics for Stabilized Properties by Property Type. *Notes:* This table presents summary statistics for loans on the largest five stabilized property types disaggregated by full vs. partial recourse. All loans are originated in 2015 or later. Values are as of loan origination. Loan shares, values, and loan balances are unweighted averages.
Source: Authors' calculations using the Y-14 CRE Schedule.

	Quintile				
	1	2	3	4	5
Recourse					
Stabilized	10	40	65	85	93
Retail	15	51	74	88	96
Industrial	14	57	74	86	93
Multifamily	5	28	57	83	93
Lodging	12	45	64	90	97
Office	14	47	72	85	92
Transitional	24	53	75	86	95
Cross-Collateralized					
Stabilized	1	4	6	9	27
Retail	1	4	6	9	33
Industrial	1	4	6	9	38
Multifamily	0	2	4	7	17
Lodging	0	4	8	15	37
Office	1	4	8	11	28
Transitional	1	4	8	13	27

Table A.3: Variation in Recourse and Cross-Collateralized Share Across Lenders.
Notes: This table presents unweighted recourse and cross-collateralization shares at banks split into quintiles for the property types shown in Tables 1 and 2. Each quintile has about 1/5th of banks, but given there are up to 34 banks, depending on the quarter, the quintiles can have slightly different numbers of banks. The banks in a given quintile can vary for each property type.
Source: Authors' calculations using Y-14 CRE Schedule.

	Quintile				
	1	2	3	4	5
Recourse					
Stabilized	60	68	72	76	84
Retail	65	73	77	80	87
Industrial	64	74	77	81	89
Multifamily	40	53	62	71	86
Lodging	44	61	69	78	87
Office	57	68	74	80	87
Transitional	61	69	74	78	86
Cross-Collateralized					
Stabilized	3	5	7	9	13
Retail	2	5	7	9	15
Industrial	1	4	6	9	19
Multifamily	1	3	4	6	12
Lodging	2	8	11	16	31
Office	2	6	7	9	17
Transitional	5	7	8	10	17

Table A.4: Variation in Recourse and Cross-Collateralized Share Across States. Notes: This table presents unweighted recourse and cross-collateralization shares at states split into quintiles for the property types shown in Tables 1 and 2. Each quintile has about 1/5th of states, but given there are 51 states including D.C., the quintiles can have slightly different numbers of states. The states in a given quintile can vary for each property type.
Source: Authors' calculations using Y-14 CRE Schedule.

	Pre-COVID			COVID		
	Modified	Distressed	Downgraded	Modified	Distressed	Downgraded
	(1)	(2)	(3)	(4)	(5)	(6)
Recourse	0.0929	0.0524	-0.158*	-1.685***	0.124	-0.678**
	(0.0984)	(0.0523)	(0.0820)	(0.410)	(0.155)	(0.293)
Cross-Collateralized	0.468***	-0.0520	-0.0295	0.313	-0.205	-0.377
	(0.141)	(0.0635)	(0.110)	(0.424)	(0.178)	(0.349)
LTV	0.806***	0.0546	0.359**	4.708***	0.624	1.735***
	(0.213)	(0.119)	(0.169)	(0.621)	(0.396)	(0.546)
N	325,497	325,497	325,497	53,665	53,665	53,665
R2	0.04	0.02	0.02	0.08	0.03	0.05
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y
Lender Fixed Effects	Y	Y	Y	Y	Y	Y
Orig. Year Fixed Effects	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y
Property Type Fixed Effects	Y	Y	Y	Y	Y	Y

Table A.5: Dynamic Regressions For Loans on Stabilized Office, Industrial, and Multifamily Properties. *Notes:* The sample is limited to loans on stabilized office, industrial, and multifamily properties. Each column presents coefficients from regressing whether the loan is modified, distressed, or downgraded on LTV, indicators for whether the loan has recourse or is cross-collateralized, and controls. The full list of controls is shown in Table 3. Columns (1)–(3) only include loan-quarter observations from pre-2020, while columns (4)–(6) only include loan-quarter observations from 2020:Q1 to 2021:Q1. Standard errors are clustered by loan. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculations using the Y-14 CRE Schedule.