Theory and Evidence on the Resolution of Financial Distress

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We analyze a financially distressed owner-managed project. The main results of the model are: (1) borrower default is an endogenous response to the anticipated restructuring–foreclosure outcome; (2) the lender's restructuring–foreclosure decision depends critically on the interaction between project value and industry liquidity; and (3) the lender waits for the industry to recapitalize before selling assets obtained through foreclosure. Empirical analysis of a large sample of defaulted commercial real estate loans supports many of the model predictions, including restructuring–foreclosure outcomes that are consistent with endogenous borrower default and firesale discounts that vary depending on industry market conditions at the time of foreclosure. (*JEL* G33)

This research examines a simply capitalized owner-managed project to determine the causes and the consequences of financial distress. Financial distress occurs when a shock to project value leaves the owner-manager with a reduced equity stake and, hence, weak incentives to manage the project. In response to the shock, the owner-manager considers whether to default on the debt payment obligation.

If default occurs, the lender must decide whether to restructure the loan or to foreclose. In the case of a restructuring, the lender must scale back the debt payments (recreate the manager's equity stake) to give the

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owner-manager incentives to maximize the value of the project. In the case of a foreclosure, a well-capitalized buyer of a foreclosed asset provides its own equity stake, which allows the lender to capture a share of the project rents. The buyer's willingness to pay for the asset depends on its wealth and particular management skill. The lender therefore forecloses when there is a potential buyer that is both well-capitalized and sufficiently skilled at managing the project.

When deciding whether to default, the owner-manager considers whether the defaulted loan will be restructured or foreclosed. If a restructuring is anticipated, the owner-manager defaults and obtains debt forgiveness. If a foreclosure is anticipated, the owner-manager does not default if the value of the equity stake exceeds the cost of keeping the loan current. If the value of the equity stake is sufficiently low and foreclosure is anticipated, the owner-manager defaults and foreclosure occurs.

In the case of foreclosure, the lender either sells the asset immediately or manages it to be sold at a later date. It is costly for the lender to carry an asset in inventory, as it is most effectively managed by an industry expert with an equity stake in the project. When the pool of outside buyers is strong, the foreclosed asset is sold immediately because there is little gain from waiting for better-capitalized buyers to emerge. When there are no well-capitalized potential buyers, the lender incurs the cost of carrying the asset in anticipation of a higher sales price in the near future.

A unique feature of the model is that project value and potential buyer wealth interact to determine if and when default occurs, as well as the lender's payoffs in default. For example, default and foreclosure occur when the project value shock is sufficiently large and the pool of outside buyers is strong. The foreclosed asset is sold quickly, with the proceeds allocated according to the absolute priority rule. Thus, in this case, default resembles the optimal exercise of a put option, with subsequent liquidation, as in models in the tradition of Black and Scholes (1973) and Merton (1974).[1]

When the pool of outside buyers is shallow, the lender has an incentive to renegotiate the debt. In this case, and when the continuation value is positive, the borrower defaults "strategically" to obtain debt forgiveness. In other models of strategic default, such as Anderson and Sundaresan (1996), Mella-Barral and Perraudin (1997), and Fan and Sundaresan (2000), transaction costs and taxes create incentives for strategic default. In this model, the incentive for strategic default varies with the wealth of potential buyers and arises because investment incentives are improved only in a restructuring in which the borrower extracts a large share of the rents.

[1] Other models in this tradition include Acharya and Carpenter (2002) and Titman, Tompaidis, and Tsyplakov (2004).

Like Bulow and Shoven (1978) and Stromberg (2000), we consider liquidation or reorganization conditional on default. In our model, liquidation is avoided when (1) the assets are worth more to the owner-manager in continuation, and (2) market conditions indicate that lender gains associated with foreclosure and asset sale are low. In Stromberg's (2000) and this model, the value of the assets in continuation depends on the expertise of the manager of the distressed asset [the continuation value is exogenous in Bulow and Shoven (1978)]. In Bulow and Shoven (1978) and Stromberg (2000), the bank lender's share of the gains from avoiding liquidation is reduced by wealth transfers to other creditors, implying that there are incentives to liquidate and sell distressed assets at discounted values to outside entities.

In this owner-manager model there is a single lender, so there are no wealth transfers among creditors. Because a sizable equity stake is required to restore investment incentives, the gains from a restructuring accrue largely to the owner-manager. Consequently, lender gains from an outside sale must be low (management skill and wealth are in short supply) for a restructuring to occur. An interesting feature of our model is that foreclosure can occur even when there is a single lender and hence no lender coordination problems.

Payoffs to the lender from foreclosure are positively related to the liquidity of potential buyers, as in Shleifer and Vishny (1992). In their model, the well-capitalized buyer makes better investment decisions than the distressed borrower. In our model, the gains from selling to an outsider occur because (1) the buyer is more efficient at managing the asset than the incumbent borrower, or (2) the buyer has sufficient wealth to compensate for management inefficiencies and can therefore pay the lender a considerable share of the gains from improving the investment incentives. The lender prefers to sell the distressed asset to a well-capitalized buyer in this latter case, even when there are no impediments to a reorganization that improves the distressed borrower's investment incentives.

Unique predictions of our model follow from the interaction of project value shock magnitudes, the relative efficiency of management, and the wealth levels of potential buyers as they impact endogenous default decisions and outcomes conditional on default. Two empirical predictions are examined in detail. First, the model predicts that the timing of foreclosed asset sales depends on current and expected levels of potential buyer wealth. Second, due in part to the endogeneity of borrower default, the model predicts that defaulted loans are more likely to be restructured when there is a milder shock to project value, when potential buyers have limited wealth, and when incumbent managers are more efficient than outside managers.

We test model implications using a data set of over 600 financially distressed commercial real estate assets covering a period that spanned a

severe downturn and subsequent rebound in commercial real estate values. The assets were all owner-managed, and the overwhelming majority were financed with a single mortgage loan. The data come from a large insurance company that was a major supplier of permanent commercial real estate loans. Analysis suggests the data are representative of the broader market for commercial mortgage loans, in terms of financial, contractual, and collateral characteristics at debt issuance, as well how financial distress was addressed and resolved.

The data indicate whether the defaulted loans were reorganized or foreclosed, as well as the length of time between foreclosure and the sale of the asset. Consistent with the model structure, restructurings involved debt write-downs rather than exchanges of debt for equity. Proxies for the wealth of potential buyers, as well as for cross-sectional differences in project value shock magnitudes and management intensity, are utilized for testing the model predictions regarding the restructuring–foreclosure decision and the timing of foreclosed asset sale.

The analysis predicts that assets are sold relatively quickly when potential buyers are well-capitalized, but sale is delayed in the absence of deep-pocketed investors. During the worst years of the real estate downturn (when potential buyers had limited wealth), only about 12% of the foreclosed asset inventory was sold per year. However, during 1993 and 1994, when the industry began an extended recovery, the lender sold 32 and 40%, respectively, of its year-beginning inventory. Average time in inventory was longer for assets sold during this latter period, reflecting the delayed sale of foreclosed assets obtained during the downturn. Estimates of a proportional hazards model reveal cross-sectional patterns that are consistent with these time series outcomes. For example, office properties, which experienced an especially severe industry shock, were sold more slowly than apartment properties, which experienced a much smaller shock.

The pattern of asset sales suggests that (1) an adverse shock to wealth created a wedge between the fundamental value of assets and the price at which assets could be sold, and (2) the lender perceived asset values would return to fundamental values either as well-capitalized outsiders entered the industry or as insiders recapitalized. As further evidence in this regard, assets are found to have sold at 20 to 30% discounts to their fundamental value on average, where firesale discounts varied depending on market conditions at the time of loan foreclosure. These findings complement outstanding empirical evidence on the relation between industry liquidity and asset value [e.g., Pulvino (1998) and Brown (2000)].

The data on restructuring versus foreclosure outcomes reveal that foreclosure occurred more frequently with loans that defaulted during the worst years of the downturn—a time when it was also more difficult

for the lender to sell foreclosed property. Restructuring became more prevalent as market conditions improved and there was a ready market for foreclosed properties. What explains these paradoxical outcomes? The sharp downturn in commercial real estate values simultaneously constrained potential buyers and made option-based default attractive to the borrower. While the lender may have preferred to restructure in the presence of limited industry wealth, foreclosure rates were high because many borrowers were willing to walk away from the assets. However, during the recovery period, continuation values were higher, and borrowers defaulted only when they anticipated a restructuring. These outcomes are therefore consistent with endogenous borrower default; indeed, they are difficult to reconcile without appealing to endogenous default.

The choice to restructure versus foreclose is regressed against cross-sectional and time-varying proxies for the project value shock, sector wealth, and asset management specificity. Logit model estimations support the idea that restructuring conditional on default is negatively related to the extent of the project value shock and the strength of the market for foreclosed assets, and positively related to the asset's management specificity. Logit model estimations and analysis of the timing of foreclosed asset sales further support model predictions that, when potential buyers have limited wealth, the lender prefers restructuring over foreclosure and delayed over immediate asset sale.

The model predicts that projects that are foreclosed will, on average, have performed more poorly than projects that are restructured. This occurs because borrowers that anticipate foreclosure default only when prospects are very poor. Stromberg (2000) also argues that foreclosed assets experience poor predefault operating performance. In his setting, poorly performing assets are badly managed, and liquidation transfers the asset to a more efficient operator. Our model can address this cause and effect relation, but idiosyncratic management problems are unlikely to explain our finding that loans collateralized by poorly performing property *sectors* were more likely to be foreclosed. Rather, consistent with our model structure, general equilibrium factors seem to explain the relations.

The data provide information about capital expenditures made by the lender to improve or reposition the foreclosed properties prior to asset sale. This lender made capital expenditures on the order of three to four times that of a typical nondistressed owner-manager, implying that financially distressed borrowers significantly underinvested in property maintenance or were unwilling to make necessary investments in the face of changing market conditions. These results complement evidence in Asquith, Gertner, and Scharfstein (1994) that firms reduce their capital expenditures following financial distress.

1. A Model of Financial Distress for an Owner-Managed Project

In Figure 1 we depict the stages of financial distress. Assuming a negative shock to project value, in the first stage the owner-manager either defaults or uses available cash to make the current loan payment. In default the game moves to a second stage, where the lender chooses whether to restructure or foreclose. The third stage occurs if the loan is foreclosed. In this case the lender chooses to manage the foreclosed asset in-house or sell it to an outside buyer.

We will now describe the model and then derive the lender's payoffs. These payoffs determine the conditions under which the defaulted loan is restructured or foreclosed, and when the foreclosed asset is sold to an outside buyer versus managed in-house. The conditions for borrower default are also derived.

1.1 Model Framework

Consider a project financed by owner-manager equity and outside debt. The project collateralizes the debt, and liability is limited to the owner's equity contribution. All agents are risk-neutral, and the risk-free rate of interest is zero. The debt contract calls for payments of P_0 at $t = 0$ and P_1 at $t = 1$. At $t = 0$, the owner-manager has sufficient uncommitted liquidity to make the required payment, P_0. The project's cash flows are realized at

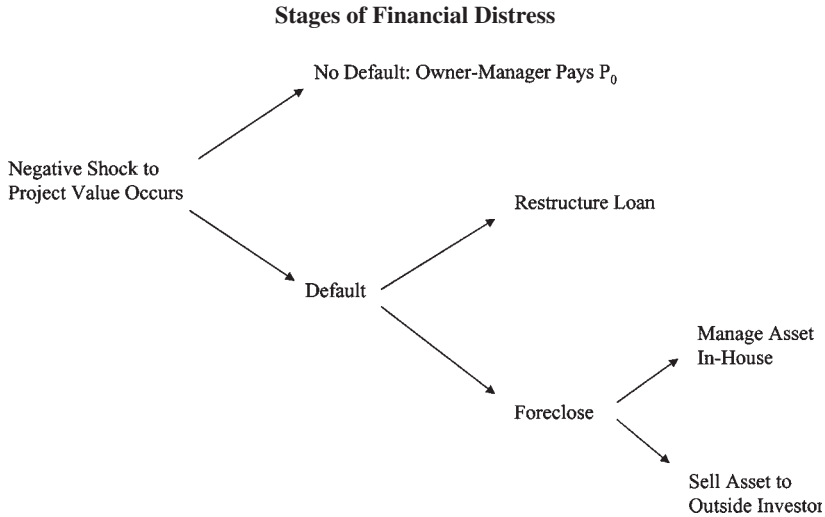

Figure 1
The financial distress process
A negative shock of size B to project value occurs. The initial move is made by the borrower, who chooses whether to default or make the loan payment. Conditional on default, the loan is either restructured or foreclosed. Finally, the lender chooses to either manage the foreclosed asset in-house for some time or liquidate the project through a sale to a third party.

$t = 1$ and depend on two factors: the observable state of the economy at $t = 0$ and noncontractible investment made by the owner-manager at $t = 0$. At $t = 1$, the realized cash flows are distributed to the lender and owner-manager according to absolute priority.

Denote initial project value as V and the subsequent change in project value as B. The $t = 1$ cash flow is $V + B$ if project fundamentals are strong and the project is successful, and $V - B > 0$ if project fundamentals are weak and the project is successful. Cash flow is 0 if the project is unsuccessful. The ultimate success of the project is not revealed until some time after $t = 0$ (but before $t = 1$). When project fundamentals are strong, the borrower does not default. When they are weak, it may be rational for the borrower to consider default. The financial distress process depicted in Figure 1 presumes a weak economy with project value shock, B. To streamline the analysis we assume the terminal debt payment, P_1, is greater than V/2.

Noncontractible investment by the owner-manager affects project value through its likelihood of success. The probability that the project is successful is ρ, $0 \leq \rho < 1$, where ρ is chosen by the owner-manager knowing the state of the economy. Noncontractible investment has a cost of $C(\rho)$, which is increasing and convex as a function of ρ. The owner-manager makes the default-payment decision prior to investing at time $t = 0$.[2]

Two related features of this model are: (1) owner-managed projects are not financed with outside equity, and (2) debt restructurings involve debt forgiveness rather than debt-for-equity exchanges. We see both in our sample of owner-managed projects with a single source of secured debt. The following discussion addresses how the owner-manager's role in determining the probability of project success motivates the use of outside debt financing in the initial capital structure, as well as why distressed workouts involve debt forgiveness rather than debt-for-equity swaps.

In the formal model, the costs of investment are exclusively borne by the owner-manager. Thus, $C(\rho)$ can be thought of as the owner-manager's disutility of effort to maintain the asset. When the external capital provider holds a senior claim on the project's cash flows, and the owner-manager is the sole residual claimant, investment effort distortions associated with raising outside capital are minimized.[3] In a weak economy the underinvestment problem is acute, motivating the lender to

[2] This model is designed to capture the realistic possibility that exogenous factors affect the profitability of a project after the initial financing is sought. We could reduce the agency problems associated with outside financing by letting the lender own the project until the state of the economy is revealed, and then allow it to sell a stake in the project to the owner-manager just before the investment choice is made. However, forcing the owner-manager to have a stake in the project before the state of the economy is revealed may mitigate the moral hazard problem that the owner has some private information about the success of the project. To address this issue, we could introduce asymmetric information and require the manager to invest before the state of the economy is revealed and then again after the state of the economy is revealed.

[3] The model makes it inefficient for the owner-manager to have a very small equity stake in the project, implying no separation of ownership from management.

consider a financial restructuring to improve the borrower's investment incentives. The outside capital provider, the lender, must scale back its claim to encourage the manager to supply effort. Incentives to supply effort are not improved by the lender taking an equity stake in exchange for debt forgiveness.[4]

In the case of default, either the debt is restructured or foreclosure occurs with the asset being sold to another owner-manager. The potential outside buyer can use wealth of W, together with debt finance to purchase the foreclosed asset from the lender. The incumbent owner-manager is assumed to have no meaningful wealth to inject into the project in a restructuring (i.e., the manager invests nearly all its available wealth to purchase the asset).

We assume the current owner-manager has no meaningful wealth to contribute to a restructuring for two reasons. First, because the owner-manager is risk-neutral, and there is an underinvestment problem associated with outside financing, it is optimal for the owner-manager to contribute its entire wealth to the project at origination. Second, and more important, allowing the owner-manager to have a limited amount of wealth to contribute to a restructuring does not change the basic conclusions of the analysis. When we solve the model for the more general case assuming the current manager has some level of wealth, the outcomes depend on the difference between the current manager's and the outside buyer's wealth (see the Appendix). Thus, rather than specify both current manager and outside buyer wealth, we normalize the current manager's wealth to zero.

1.2 Owner-Manager Investment

The expected payoff to the owner-manager is a function of the investment made, the state of the economy, and the amount of debt due at $t = 1$. There are two potential long-run project managers: the incumbent owner-manager or an outside owner-manager that acquires the project from the lender in foreclosure. Each has its own unique investment technology.

The amount of debt due at $t = 1$, F, depends on the situation. If the incumbent does not default, then $F = P_1$. If default occurs and the loan is restructured, some debt is forgiven depending on negotiations between the borrower and lender. If the project is foreclosed and sold to an outside buyer, the amount of debt available to finance the project depends on the productivity of the new owner-manager.

[4] Two important caveats are warranted. First, the outside capital provider's claim is referred to as a "debt contract." Since the cash flow is assumed to be zero when the project is unsuccessful, the financial contracts are simply a division of cash flow if the project is successful. If the payoff to an unsuccessful project is positive but less than the face value of the debt, there would be a meaningful distinction between debt and equity claims, and distressed borrower incentives would be improved only with write-downs of the outstanding debt. Second, we have not shown that debt is an optimal contract in this setting, but outside debt financing clearly provides better owner-manager investment incentives than outside equity financing. Innes (1990) shows that debt financing (1) provides superior incentives and (2) is optimal assuming risk-neutral agents. Dewatripont, Legros, and Matthews (2002) show the optimality of outside debt financing in the presence of moral hazard holds under more general conditions.

In a weak economy, the expected payoff to the owner-manager at $t = 1$ is $\rho_i[V - B - F] - C_i(\rho_i)$, where $i = 1$ indicates the incumbent owner-manager, and $i = 2$ indicates the outside buyer. For simplicity, the investment technology is assumed to take the form $C_i(\rho) = \beta_i\rho^2$, where β_i is scaled so as to ensure $\rho < 1$. Optimal investment is thus

$$\rho_i(F) = [V - B - F]/2\beta_i \tag{1}$$

when the numerator is positive; otherwise, $\rho_i(F) = 0$. Owner-manager investment depends on the size of the residual equity claim when the project is successful (as seen in the numerator) and management efficiency (as seen in the denominator).

1.3 Lender Payoffs from Restructuring and Foreclosure

In a restructuring, the lender is assumed to make a take-it-or-leave-it offer to the borrower. This occurs before the borrower makes the coupon payment, P_0, or decides on the level of investment. The offer nullifies the original loan contract and stipulates the new amount of debt due at $t = 1$. If the borrower accepts the offer, no coupon payment is required at $t = 0$, and investment in the asset occurs based on the renegotiated debt payoff due at $t = 1$. If the borrower rejects the offer, the loan is foreclosed.

The lender's optimal offer is a new debt payoff amount, F_1, that maximizes

$$\rho_1(F_1)F_1 \tag{2}$$

subject to the owner-manager's participation constraint

$$\rho_1(F_1)[V - B - F_1] \geq C_1(\rho_1(F_1)). \tag{3}$$

The solution to the lender's maximization problem yields

$$F_1{}^* = (V - B)/2 \tag{4}$$

and

$$\rho_1(F_1{}^*) = (V - B)/4\beta_1. \tag{5}$$

One critical aspect of a restructuring is that the owner-manager maintains a significant share of the rents from the project. In other words, the participation constraint in Equation (3) is not binding.

The payoff to the lender from foreclosure and asset sale depends on the characteristics of the potential buyer at the time of foreclosure—specifically, W and β_2. The most a potential buyer is willing to pay for the project is the market value of debt that can be borrowed against the asset plus its personal wealth, W, subject to a participation constraint.

The maximum amount of debt that can be borrowed against the project at t = 0 is $\rho_2(F_2)F_2$, as stated in Equations (4) and (5), where $\rho_2(F_2^*)F_2^* = (V - B)^2 / 8\beta_2$. Thus, a potential buyer is willing to pay more for the project than the lender's expected payoff from a restructuring if:

$$W + (V - B)^2/8\beta_2 > (V - B)^2/8\beta_1. \tag{6}$$

The actual wealth contributed as equity by the outsider is limited by the participation constraint:

$$W \leq \overline{W} = \rho_2(F_2^*)[V - B - F_2^*] - \beta_2[\rho_2(F_2^*)]^2. \tag{7}$$

Rearranging Equation (6) leads to Proposition 1.

Proposition 1. *An outside buyer with wealth W and investment technology parameter β_2 is willing to pay more for the financially distressed asset than the lender's payoff in restructuring if and only if*

$$W \geq \underline{W} = Max\left\{\left(\frac{(V-B)^2}{8}\right)\left[\frac{1}{\beta_1} - \frac{1}{\beta_2}\right], 0\right\}$$

and the participation condition in Equation (7) is satisfied.

See the Appendix for proofs of the propositions. Foreclosure and asset sale dominate restructuring whenever $\beta_2 < \beta_1$ (i.e., when the outside buyer is more efficient than the current owner at managing the project). When the outside buyer is less efficient than the incumbent at managing the asset, the necessary conditions expressed in Equations (6) and (7) indicate that β_1 and β_2 must be such that $2\beta_2 / 3 \leq \beta_1 < \beta_2$. If the outside buyer is extremely inefficient compared to the incumbent ($\beta_1 < 2\beta_2 / 3$), the lender will always prefer restructuring over foreclosure and immediate sale, no matter how wealthy the outsider is. More generally, the level of wealth, W, required to make an offer for the asset increases with $\beta_2 - \beta_1$, implying diminishing economic rents to the outside buyer the greater the difference in owner-manager efficiency.

There are three points worth emphasizing with regard to lender payoffs from reorganization versus liquidation. First, the model provides a different motivation from that in Shleifer and Vishny (1992) for selling assets to well-capitalized buyers. In Shleifer and Vishny (1992), well-capitalized buyers purchase financially distressed assets because debt overhang problems are less severe, implying they have better investment incentives than the financially distressed firm. In our model, the lender can improve the financially distressed borrower's balance sheet and investment incentives by restructuring the debt. Because of this option, the lender sells the asset to an outsider (rather than restructure the debt) only when the outsider is

willing and able to pay for a portion of the gains from improving investment incentives. Only sufficiently productive and wealthy outsiders can pay for a sizeable portion of the economic rents in the project.

Second, the incumbent owner-manager captures the rents from improving investment incentives and avoiding foreclosure. The lender's inability to capture rents in a restructuring creates the potential for a foreclosure. Thus, in contrast to Bulow and Shoven (1978) and Stromberg (2000), where the bank lender is motivated to foreclose because wealth is transferred to other lenders in a restructuring, in this model inefficient liquidations can occur with only a single debtholder.

Third, conditional on default and the size of the project value shock B, the two factors that drive the liquidate-versus-restructure decision are the wealth of the outside buyer (W) and its management efficiency compared to the incumbent owner-manager ($\beta_2 - \beta_1$). Liquidation occurs when an outsider is willing to contribute more equity to the project than the difference between the value of the asset run by the current manager and a less-skilled outsider. The extent of the project value shock, B, plays a relatively *unimportant* role in the lender's restructuring–foreclosure decision at this point because it is exogenously given and is, therefore, sunk and common to all potential asset owners.

1.4 Managing the Asset In-House

The lender can carry the foreclosed asset in inventory rather than sell it immediately to an outside buyer.[5] The lender may wish to carry the asset because it anticipates the industry will recapitalize in the near future, which implies greater wealth and more competition among outside buyers. Carrying distressed collateral in inventory is costly, however, since the lender does not have a comparative advantage in asset management.[6]

Formally, we assume that, if the lender repossesses the asset at $t = 0$, it can be managed in-house until some time before $t = 1$, at which time the asset is sold to an outside buyer. The cost of carrying the asset in inventory is K. For positive K, the lender manages the asset only when it perceives that the industry will recapitalize prior to $t = 1$; otherwise, it is better off foreclosing and selling the asset immediately.

Let the expected wealth of the future outside buyer equal W_{t+1}, which is assumed to be at least W.[7] We assume $W_{t+1} - W$ is nonnegative, because

[5] U.S. banks are subject to modest holding-period limits when they take equity in exchange for debt forgiveness [see James (1995)]. We are aware of no such limitations for insurance companies.

[6] The lender's initial decision to provide debt financing reveals its desire to own a fixed claim against the asset rather than an equity stake in the project.

[7] W_{t+1} is likely to be greater than W because the shock to project value that leads to financial distress would generally adversely affect potential buyer wealth. When W_{t+1} is less than W, the lender never delays the sale of a foreclosed asset.

industry wealth levels regress toward a long-run equilibrium after a negative shock. While both higher W and lower β_2 entities may emerge, for simplicity we focus on W. Further assume that the outsider's participation constraint expressed in Equation (7) is not binding at $t = 0$, which implies that the lender's payoff increases one-for-one with the wealth of the outside buyer.

In this setting, foreclosure and delayed sale dominate restructuring at $t = 0$ when

$$W_{t+1} - K > \underline{W} \tag{8}$$

where $\underline{W}$ is as defined in Proposition 1. Foreclosure and delayed sale dominate foreclosure and immediate sale when

$$W_{t+1} - K > W \tag{9}$$

Thus, both Equation (8) and Equation (9) must hold simultaneously for a foreclosure and delayed asset sale outcome to occur.

To characterize the set of outcomes in terms of outsider buyer wealth at $t = 0$ (the time of default), we further assume that (1) W_{t+1} increases with W, where both W_{t+1} and W are continuous variables; and (2) $W_{t+1} - W$ decreases with W (i.e., the industry recapitalizes more quickly when industry wealth is limited and asset prices are low relative to fundamentals).

These assumptions imply there is a unique W, $W = \widetilde{W}$, such that $W_{t+1} - K = \widetilde{W}$. For $W > (<) \widetilde{W}$, it is the case that $W_{t+1} - K < (>) W$. Thus, for $W > \widetilde{W}$, immediate sale dominates delayed sale. Conversely, if $W < \widetilde{W}$, Equation (9) holds, implying the industry is expected to recapitalize quickly enough for the lender to find it optimal to wait for a higher valued buyer to emerge.

Rational delayed sale requires that it also dominate restructuring [as expressed in Equation (8)]. If $\widetilde{W} < \underline{W}$, delayed sales will never occur. In this case, asset carrying costs are high. Thus, in this situation, for $W < \underline{W}$, a restructuring occurs. For $W > \underline{W}$, it will also be the case that $W > \widetilde{W}$, so foreclosure and immediate sale occur. If, on the other hand, $\widetilde{W} > \underline{W}$ for all W, foreclosure with delayed asset sale always dominates restructuring. In this case, industry conditions are expected to be particularly robust in the next period. Thus, for $W < \widetilde{W}$, foreclosure and delayed sale occur, while foreclosure and immediate sale occur when $W > \widetilde{W}$.

These two cases suggest that restructurings and foreclosures with delayed asset sales cannot both occur in a given market setting as a function of W. In general, we would instead expect to see all three outcomes (restructuring, foreclosure-delayed sale, foreclosure-immediate sale) in the cross-section as a function of industry conditions. In a third, intermediate case, it may be that foreclosure with delayed asset sale does not dominate restructuring at very low current wealth levels, but at

somewhat higher current wealth levels, foreclosure with delayed sales dominates both restructuring and foreclosure with immediate sale.

To generate this intermediate case, we also assume that (3) there is a unique W, $0 < W < \underline{W}$, denoted as $\breve{W}$, such that $W_{t+1} - K = \underline{W}$ when $W = \breve{W}$. Because $W < \underline{W}$ when $W_{t+1} - K = \underline{W}$, it immediately follows that $\breve{W} < \tilde{W}$. This says that the indifference point between restructuring and foreclosure with delayed asset sale is below the indifference point between foreclosure with delayed sale and immediate sale. Thus, as a function of current industry wealth, there exists a region where foreclosure with delayed asset sale is preferred to both restructuring and foreclosure with immediate sale.

It follows that, when $W < \breve{W}$, restructuring dominates both foreclosure with delayed asset sale and foreclosure with immediate sale. This final relation defines a region where, as a function of current industry conditions, restructurings in addition to foreclosures with immediate or delayed sale can occur as a function of current industry wealth, W. These possible outcomes are summarized in Proposition 2.

Proposition 2. *Given assumptions (1)–(3) and a nonbinding participation constraint, there are a unique* $\breve{W}$ *and* $\tilde{W}, \underline{W} < \tilde{W}$, *such that, for* $W < \breve{W}$, *a restructuring occurs; for* $\breve{W} < W < \tilde{W}$, *a foreclosure and delayed sale occurs; and for* $W > \tilde{W}$, *a foreclosure with immediate sale occurs.*

1.5 Borrower's Decision to Default

The borrower's decision to default depends on whether foreclosure or restructuring is anticipated as a result of default. When a restructuring is anticipated, the borrower defaults because its debt is forgiven. If the borrower defaults and is foreclosed upon, its payoff is zero. Consequently, if the borrower anticipates a default will result in foreclosure, it makes the contracted payment of P_0 to avoid default if and only if its equity position from continuation exceeds P_0. Proposition 3 states the default condition.

Proposition 3. *Default followed by foreclosure occurs when the owner-manager anticipates foreclosure in default and* $B > B^*$, *where* $B^* = V - P_1 - 2\sqrt{\beta_1 P_0}$.

The critical default value, B*, depends intuitively on model parameters. Clearly, the greater the shock to project value, the less likely it is that the owner-manager will make the current debt payment necessary to avoid default. Note that this critical value does not depend on outside investor parameters W or β_2, since option-based default is specific to borrower circumstances. This does not imply that the *default decision* is independent of W or β_2, however, since the outcome of default depends on W relative to $\breve{W}$, where $\breve{W}$ is a function of the productivity of the outside investor.

1.6 Model Summary and Empirical Implications

The model indicates that the shock to project value (B) and the liquidity of outside buyers (W) largely drive the outcomes of the financial distress. Figure 2 characterizes the fully developed model and depicts realizations of B and W that result in (a) no default (continuation); (b) default followed by a loan restructuring; (c) default followed by foreclosure and immediate asset sale; and (d) default followed by foreclosure and delayed asset sale.

When the shock to project value is relatively small, such that $B < B^*$, the owner-manager's continuation value is positive. If industry wealth is simultaneously low ($W < \breve{W}$), the borrower strategically defaults, knowing it can extract concessions through a debt restructuring. If, however, $W > \breve{W}$, the borrower does not default. Industry wealth is high enough so that

Equilibrium Default-Restructuring-Foreclosure Decision in (B,W) Space

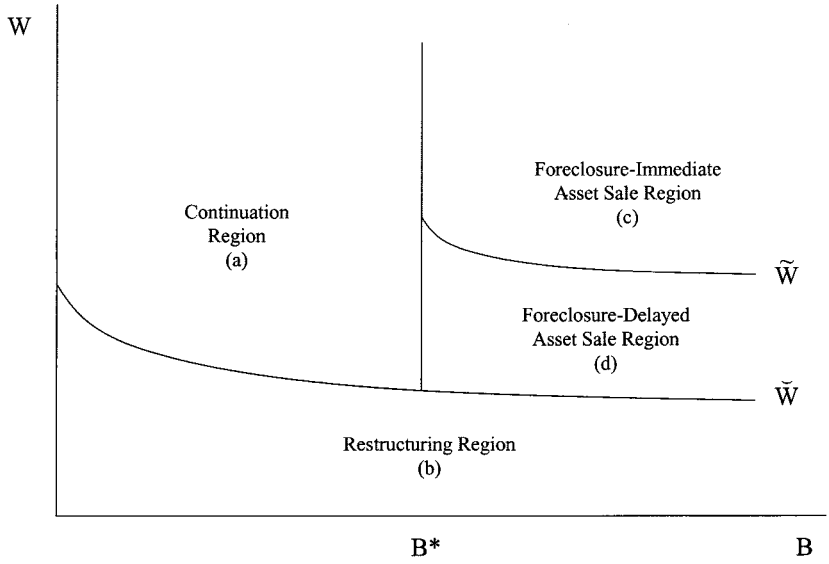

Figure 2
Effects of size of shock and wealth of potential buyers
Realizations of B (size of the shock to project value) and W (wealth of potential buyers) result in (a) continuation (no default), (b) restructuring, (c) foreclosure and immediate asset sale, and (d) foreclosure and delayed asset sale. When $W > \breve{W}$ and $B < B^*$, the borrower continues (does not default), since foreclosure is a credible option for the lender, and the expected payoff to continuation is positive. When $W < \breve{W}$, the borrower defaults, and the loan is restructured. In this case, if $B < B^*$, the borrower defaults strategically, knowing the lender will restructure. If $B > B^*$ and $W > \breve{W}$, the borrower defaults, anticipating foreclosure, since continuation has a negative value. When $\breve{W} < W < \tilde{W}$ and $B > B^*$, the borrower defaults, the loan is foreclosed, and asset sale is delayed. When $W > \tilde{W}$ and $B > B^*$, the borrower defaults, the loan is foreclosed, and asset sale is immediate.

foreclosure is valued more highly than a debt restructuring by the lender, which precludes a strategic default.

When $B > B^*$, the owner-manager's continuation value is negative, and an option-based default occurs. If industry wealth is low ($W < \breve{W}$), the lender restructures the loan because foreclosure would require selling the asset at a significant discount to its fundamental value. Thus, a loan restructuring always occurs any time industry wealth is low, regardless of the size of the shock to project value. When industry wealth is high enough ($W > \breve{W}$), the owner-manager defaults, and foreclosure occurs. Foreclosed asset sale is delayed when industry wealth is at moderate levels and expected to increase in the near future ($\breve{W} < W < \tilde{W}$). Foreclosed asset sale is immediate when industry wealth is high ($W > \tilde{W}$).

The boundary that defines the restructuring region, $\breve{W}$, depends on the comparative productivity of the incumbent owner-manager. Incumbents who manage specialized assets may have a significant advantage over outsiders, implying that $\beta_2 - \beta_1$ is relatively large. A greater disparity in management skill moves the $\breve{W}$ boundary upward, increasing the likelihood of a restructuring.

Outcomes also depend on the lender's carrying cost parameter, K, which is implicit in the location of both $\tilde{W}$ and $\breve{W}$. An increase in carrying costs results in a parallel downward shift in $\tilde{W}$ to make a foreclosure-delayed sale outcome less likely than a foreclosure-immediate sale. A simultaneous upward shift in $\breve{W}$ ocurs to account for the fact that W_{t+1} and, hence, W must increase to offset the increase in K. This makes restructuring more likely than a foreclosure-delayed sale. Thus, when K increases, the foreclosure-delayed sale region is squeezed from both sides because of a reduction in $\tilde{W}$ and an increase in $\breve{W}$. If K is large enough, the foreclosure-delayed sale region disappears altogether, and only restructurings or foreclosure-immediate sales occur.

The analysis assumes the distressed borrower has no wealth to contribute in a restructuring. Relaxing this assumption has two implications. First, when the borrower has wealth to contribute to a restructuring, outside buyers must have more wealth for the lender to prefer foreclosure over restructuring (i.e., $\underline{W}$ and therefore $\breve{W}$ increase). Furthermore, the borrower extracts lower rents in a restructuring when it contributes wealth. In general, to the extent that the current owner-manager is more efficient at operating the asset than outsiders, its available wealth is socially desirable.

Second, a distressed borrower who may have to commit wealth in a restructuring has less of an incentive to default strategically. When the borrower has no wealth to contribute, restructurings reduce the debt obligation. Consequently, as noted earlier, restructuring dominates continuation for all values of B when a restructuring is anticipated. If the borrower has available wealth, however, and competition forces it to

contribute some of that wealth in a restructuring, restructuring is not as attractive. Thus, for low values of B, strictly lower than B*, the borrower finds it optimal to continue rather than default when it anticipates a restructuring.

An implication of the model is that financially distressed projects that are foreclosed will, on average, have performed more poorly than projects that are restructured. That is, B in a foreclosure has a higher average value than B in a restructuring. Stromberg (2000) finds, in a set of bankrupt Swedish firms, that firms liquidated in bankruptcy have worse pre-bankruptcy performance than firms reorganized in bankruptcy. He interprets this finding as evidence that poorly managed firms are more likely to be liquidated and sold to a better manager.

The link between project performance and the probability of liquidation is potentially very different in our model. Endogenous borrower default implies that poorly performing loans may be liquidated because borrowers with low continuation values do not find it rational to avoid a default that leads to liquidation.

Because the size of the project shock B, and the level of sector wealth, W, are often correlated, our model suggests there will be asset firesale discounts that will vary as B and W vary over time. When B is high and W is low, borrowers will default because project continuation value is negative, and will significantly underinvest in the asset. This leads to increased levels of foreclosure of assets in poor operating condition. There will be incentives for the lender to carry these assets in inventory to avoid selling into a distressed market, implying longer times in inventory. The sales *timing* decision will thus depend on current industry market conditions (W), where the actual sales *discount* will also depend on project-related conditions at the time of foreclosure (B).

Further unique empirical predictions follow from endogenous default in relation to the combined effects of project value shock magnitudes (B), relative management efficiency (β_1,β_2), and sector wealth (W). Assuming foreclosure, the timing decision to sell a foreclosed asset will depend on current and expected sector wealth levels in addition to the management efficiency of outside buyers. When the incumbent borrower is efficient at operating the asset, we also predict that the restructuring–foreclosure outcome depends uniquely on the extent of the shock, B, in addition to wealth levels and potential outside owner efficiency. In our model, like Stromberg (2000), relative management efficiency plays a role in the restructuring–foreclosure decision. But our model also includes a well-defined role for outside investor wealth and endogenous default.

Finally, the model provides unique explanations for time series patterns of restructuring–foreclosure outcomes when project value shock and wealth levels change over time. Other models of financial distress cannot

simultaneously explain why, when large systematic shocks occur to a sector, foreclosure tends to occur more frequently (option-based default occurs, and the lender holds assets in inventory), but when value and wealth levels begin to recover, restructuring is the more frequent outcome (strategic default occurs in anticipation of a restructuring).

2. Data Description and Market Overview

In this section we describe the distressed loan sample and put it in the context of broader market condition that existed at the time. We also consider the unique aspects of commercial mortgage contracting and state foreclosure law, and compare our loan sample to industry data to assess its statistical robustness.

2.1 Distressed Loan Sample

Model implications are examined using a data set of financially distressed commercial real estate loans originated by a large multiline life insurance company. Commercial real estate loan data are useful for testing the model implications for several reasons. First, commercial real estate assets are typically owner-managed and have a single source of secured debt financing. Owner-managers play an important role in the success of commercial real estate assets, as discussed by Williams (2001). Second, the sample period covers the major commercial real estate downturn and recovery that occurred during the late 1980s to the middle 1990s. This provides a large number of defaulted loan observations and significant variation in industry conditions across time. Third, commercial mortgages are issued with high frequency, and contracting is relatively homogeneous, which improves statistical reliability. Fourth, insurance companies have considerable discretion in their negotiations with distressed borrowers and in timing the sale of foreclosed assets.

The data set includes 2589 commercial real estate loans originated between 1974 and 1990. We know whether borrowers ever incurred a payment default, which is defined as 90 days or more delinquent. The company electronically recorded the status of financially distressed loans from 1986 to 1995. During this period, 807 of the 2589 loans experienced a payment default, for a cumulative default rate of 31.1%.[8]

Loan status indicators identify the relevant stages of financial distress as (1) restructured, (2) foreclosed, and (3) sale of foreclosed asset. A total

[8] There is left-censoring as well as right-censoring of the data that affects the analysis. Some loans originated before 1986 experienced financial distress before loan status indicators were available. Availability of left-censored data would have increased the total number of defaulted loans and the lifetime default rate. Some loans may also have defaulted after 1995, the end of our sample period. Our judgment is that left- and right-censoring do not present significant statistical issues, as commercial real estate markets were relatively healthy before 1985 and after 1995 (before the market crash and after the recovery).

of 631 commercial real estate loans were either restructured (N = 289) or foreclosed (N = 342) during 1986–1995. This implies that 176 of the defaulted loans were neither restructured nor foreclosed (807 minus 631). Thus, of the 807 defaulted loans, 35.8% were initially restructured, 42.4% were foreclosed without restructuring, and 21.8% were neither restructured nor foreclosured. Of the 289 restructurings, 70 were eventually foreclosed, for a total of 412 foreclosures. The lender sold 270 of the 412 foreclosed loans before year-end 1995.

Detailed cash flow data are available on all restructured and foreclosed loans, and include all loan fundings and borrower payments. In the case of restructured loans, the data show any reductions in contractually specified payments. In the case of foreclosed loans, an estimated asset value (called the transfer value) is assigned to the property at the time of foreclosure. All revenues and expenses realized during the in-house asset ownership period, as well as the realized sales price at the time of asset sale, are also available.

A review of the data and follow-up conversations with the lender provide information about the nature of the restructurings in financial distress. Restructured loan status codes and cash flow patterns indicate that the lender never took back an equity stake from a financially distressed borrower in return for reducing the loan balance. Instead, restructurings were simple write-downs. This is consistent with the model, which requires that restructurings involve loan write-downs (without equity exchanges) in order to improve noncontractible investment incentives. The data further indicate that most defaults occurred before the maturity date of the loan. In these cases, debt restructurings did not typically extend maturity. Rather, a vast majority of the restructured loans were write-downs that lowered the required payments and effectively reduced the loan balance.

2.2 Commercial Real Estate Downturn and Recovery

A significant decline in U.S. commercial real estate values occurred in the late 1980s and early 1990s. The primary cause was overbuilding and resulting credit problems that limited financing availability for borrowers [see Fergus and Goodman (1994), Peek and Rosengren (1994), and Brown (2000)].

Figure 3 traces the value of a $100 position invested in the National Association of Real Estate Investment Trusts (NAREIT) Equity REIT Price Index and REIT Rent Index from 1982 through the end of 1996.[9] The REIT Rent Index is the product of the Equity REIT Price Index and the dividend yield on that index. Since REITs are required to pay a large

[9] Equity REITs are nontaxed, exchange-traded firms that hold equity positions in commercial real estate assets.

Commercial Real Estate Values and Cash Flows as Measured by NAREIT Equity Index

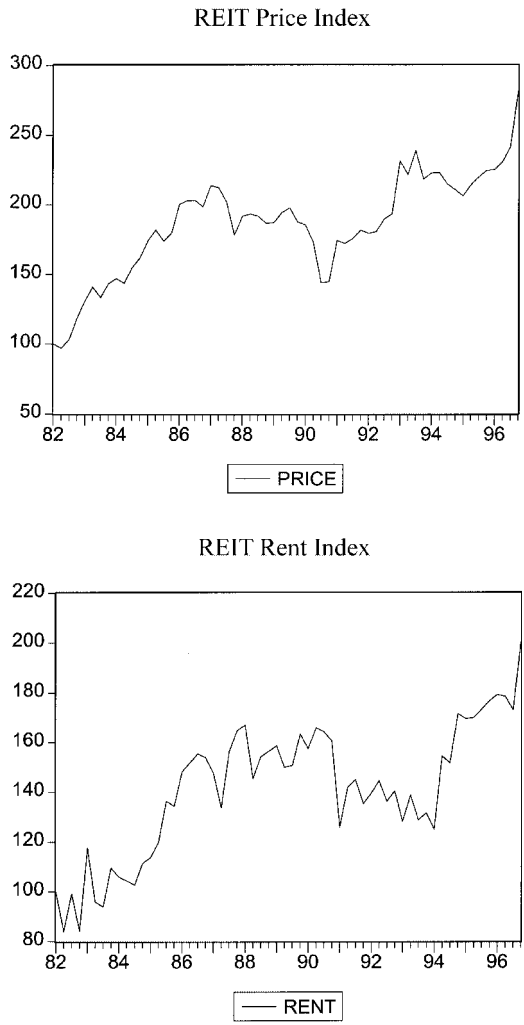

Figure 3
Value of a $100 position invested in the National Association of Real Estate Investment Trusts (NAREIT) Equity REIT Index and the NAREIT Rent Index from 1982 through 1996
The NAREIT Rent Index is the product of the NAREIT Equity Index and the dividend yield on that index.

proportion of their earnings as dividends, the time variation of the REIT Rent Index should closely approximate the time variation in rents paid on the commercial real estate held by the firms in the Index.

We see that REIT prices declined by approximately 30% from their peak at year-end 1986 to a low at year-end 1990. After the bottom, REIT asset

prices increased significantly. In comparison, rent levels peaked in early 1987 and more or less held up through early 1990. Rents then dropped significantly in late 1990 and stayed low through early 1994 before beginning to increase. Thus, prior to 1987, prices and rents were closely correlated, but then diverge with prices leading rents by several years.[10]

Property type underlying a loan proxies for cross-sectional variation in the shock to project fundamentals (B). Table 1 shows peak-to-trough percentage changes in NCREIF index property values for the four core property types over the sample period.[11] We see the smallest decline in property values for apartment properties and the largest for office properties. These outcomes reflect differences in economic fundamentals: apartment property was the least overbuilt of all property types during the sample period, and office property was the most overbuilt.

Property type and asset size proxy for differences in an asset's sensitivity to management quality. For example, apartment property tends to be generic and, thus, not particularly management sensitive. Hotel property is the most management sensitive. Larger assets tend to be more complex to operate than smaller assets, and thus are more sensitive to management quality. Table 2 shows that size and property type are related. Apartment and industrial properties tend to be the smallest of the property types, while hotel and office properties tend to be the largest.

2.3 Commercial Mortgage Contracting and State Foreclosure Laws

There is considerable uniformity in commercial mortgage contracting. All the loans we analyze are fixed-rate, fixed-payment mortgages with

Table 1
Commercial Real Estate Asset Value Declines by Property Segment

Property segment	Asset value decline
Apartment	−16.8%
Office	−53.2%
Retail	−20.2%
Industrial	−30.2%

Table 1 shows the percent decline in asset values from the peak of the property cycle prior to the real estate downturn through the trough of the cycle for four core property types: Apartment, Office, Retail, and Industrial. Asset value changes are calculated using NCREIF index data.

[10] The lead-lag phenomenon is largely due to the lagged information content of property rents together with large movements in fundamentals during this period. Long-term leases are often used to contract for space in commercial real estate markets. This means that current rent levels are weighted averages, reflecting current and historical spot rents. When there are large changes to spot rents, current rent levels will be a lagging indicator of economic fundamentals.

[11] The NCREIF index is composed of directly held (non-exchange-traded) commercial real estate in the four core property types (office, industrial, retail, multifamily).

Table 2
Financially Distressed Loans by Property Type and Loan Size

Loan Size	Apartment	Hotel	Industrial	Office	Retail	Other	Total
<$2m	22	0	13	36	14	1	86
	11.5%	0.0%	19.4%	13.4%	20.6%	10.0%	13.6%
$2-$4m	45	0	26	36	11	0	118
	23.6%	0.0%	38.8%	13.4%	16.2%	0.0%	18.7%
$4-$7m	67	4	15	47	16	1	150
	35.1%	15.4%	22.4%	17.5%	23.5%	10.0%	23.8%
$7-$10m	27	1	6	38	10	1	83
	14.1%	3.9%	9.0%	14.1%	14.7%	10.0%	13.2%
$10-$15m	20	5	6	31	9	1	72
	10.5%	19.2%	9.0%	11.5%	13.2%	10.0%	11.4%
$15-$25m	7	11	0	39	3	1	61
	3.7%	42.3%	0.0%	14.5%	4.4%	10.0%	9.7%
>$25m	3	5	1	42	5	5	61
	1.6%	19.2%	1.5%	15.6%	7.4%	50.0%	9.7%
Total	191	26	67	269	68	10	631
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2 categorizes the number of restructured and foreclosed loans by property type and initial loan size. Percentages are by loan size category for each property type.

nonrecourse clauses that limit the borrower's liability to the equity value of the secured collateral. The secured collateral in all cases is improved real estate. Many of the loans, especially those originated after 1980, are call-protected with maturities in the 5- to 15-year range. Loans are typically partially amortizing, with amortization periods of 15 to 30 years. For example, a loan may have a 10-year term-to-maturity with payments fully amortized over 25 years.

The vast majority of the loans analyzed were originated at loan-to-value (LTV) ratios of between 71 and 75%. We find almost no variation in LTV ratio by property type. Further analysis indicates that LTV ratios at loan origination for restructured and foreclosed loans are similar to LTV ratios at origination for *all* originated loans. This suggests that economic or manager-specific factors, and not variation in financial structure as measured by LTV ratio, are the primary cause of financial distress.

State foreclosure laws govern the relationship between the lender and the borrower in a secured commercial real estate loan transaction and ensure that an absolute priority ordering of creditors is observed [see Warren (1987)].[12] Federal law as related to Chapter 7 or 11 bankruptcy provisions is typically relevant only when a particular mortgage

[12] As Warren (1987) states: "State collection law is a system in which one creditor can isolate the debtor's default and enforce repayment.... The presence of state law rank ordering is that no claim is extinguished...the [state law] system streamlines the collection operation to ensure that the creditor can be the first to collect if the debtor's circumstances improve." State foreclosure laws are classified as either judicial or power-of-sale. The judicial law process is somewhat more bureaucratic and time consuming than the power-of-sale process [see Clauretie and Herzog (1990) and Ciochetti (1997)]. Of our 631 restructured and foreclosed loans, 183 were in judicial foreclosure law states and 448 in power-of-sale foreclosure law states.

transaction is part of a larger bankruptcy proceeding involving numerous assets and transactions. Only a small percentage of restructured or foreclosed loans are part of a Chapter 11 bankruptcy proceeding (just over 5% of the sample).[13]

2.4 Comparison to Industry Data

Because our mortgage loan sample comes from a single commercial real estate lender, a large life insurance company, one might ask whether the data are representative of the mortgage loan market as a whole. To assess this issue, we compare our data to industry data on several dimensions. First, it is worth mentioning that over the 1974–1990 sample period, insurance companies were, along with commercial banks, the largest single source of permanent long-term commercial real estate mortgage debt in the United States. Insurance company market share over this time period has been estimated at 30 to 50%.

According to the American Council of Life Insurers (ACLI), our data source originated approximately 10% of all classified insurance company loans during the sample period, placing it among the top three commercial real estate lenders in the industry. Table 3 compares the sample and ACLI data on several dimensions. There is very little difference in average loan size, average loan-to-value ratio, and average debt service coverage ratio at issuance. There are differences by property type, where our sample is

Table 3
Comparison of Mortgage Loan Sample to Insurance Industry Data

	Sample	Insurance industry
N	2,589	23,961
Average loan amount	\$6.78 mm	\$7.41 mm
Average loan-to-value ratio	0.719	0.721
Average debt coverage ratio	1.24	1.28
Apartment	27.7%	10.7%
Hotel	2.4%	8.1%
Industrial	15.0%	12.4%
Office	39.1%	48.5%
Retail	15.7%	20.3%

Table 3 compares the sample data to insurance industry data as compiled by the American Council of Life Insurers (ACLI). Data are as of the loan issuance date, and cover the 1974–1990 sample period. The debt coverage ratio is defined as initial annual net operating income divided by total annual debt service. We report only the five major property types, which slightly reduces the sizes of both our sample and the industry sample. Percentages are reported as a proportion of the reduced sample size and add to 100%.

[13] Baird and Jackson (1988) note that, "under existing law, bankruptcy courts traditionally refuse to entertain a bankruptcy case involving a corporate debtor in which there was only one creditor." This suggests that bankruptcies that occur in our data involved a number of creditors and assets that are outside the data set.

weighted more heavily toward apartment and industrial property than the industry, and less heavily toward retail, office, and hotel property.[14]

We also compare cumulative loan default rates using annual insurance company data in Esaki and Goldman (2005). Their analysis shows a cumulative default rate of 18.4% for loans originated between 1974 and 1990. This compares to a cumulative default rate of 31.1% for loans in our sample. Further comparison indicates higher cumulative default rates in our sample than for the industry in each and every year from 1974 through 1990. These findings suggest the loans in our sample were riskier than average. However, industry sources suggest that insurance industry default rates may be biased on the low side, as data are unaudited and reported annually. Specifically, insurance companies have incentives to underreport delinquent loans that are not yet restructured or in process of foreclosure, and annual data would fail to account for delinquencies that were resolved during the year. Our data were collected after the fact on the basis of internal reports, which we believe fully account for all defaults that happened throughout the year.

Finally, we compare the outcomes of financial distress to insurance industry data as reported in Esaki and Goldman (2005). In their first-time default activity data, 52% of loans were liquidated, 25% restructured, and 23% recovered. This compares to 42% of loans liquidated in our sample, 36% restructured, and 22% recovered. According to industry-wide data, of loans initially restructured, 27% were ultimately liquidated, while 24% were ultimately liquidated in our sample. Thus, these data indicate generally comparable outcomes of financial distress, but a somewhat lower percentage of liquidated loans in our sample. We believe this difference is explained at least in part by the higher proportion of apartment loans in our sample, which resulted in more restructurings than was the case for loans collateralized by other property types.

Altogether, these comparisons suggest that our mortgage loan sample is broadly similar to industry data. The data are particularly comparable at the time of origination and in terms of the outcomes of financial distress, which are the focus of our analysis.

3. Descriptive Data Analysis

We begin the formal data analysis by documenting default frequencies, restructuring–foreclosure outcomes, and the time of foreclosed asset sales. We also calculate capital expenditures made by the lender on foreclosed property in order to estimate the magnitude of borrower underinvestment in the asset. Lastly, we measure firesale discounts on

[14] We also examined the regional distribution of loans (not reported in the table). With the exception of one region (Mid-Atlantic), there are only small and statistically insignificant differences between our sample and industry data with respect to geography.

foreclosed assets that are subsequently sold by the lender, and how these discounts vary as a function of the foreclosure date.

3.1 Default Frequencies, Restructuring–Foreclosure Outcomes, and the Timing of Foreclosed Asset Sales

Table 4 displays defaulted loans by year of origination and year of onset of financial distress. The table shows that 807 of 2589 loans experienced financial distress during the 1986–1995 sample period, for a cumulative lifetime default rate of 31.1%. Annual default rates are persistently high during 1986–1990, peaking in 1991 at 6.3%. Default rates then declined quickly after that time.

The table also shows the time series of indexed REIT prices to provide a sense of industry liquidity and asset market fundamentals. REIT prices indicate deteriorating fundamentals in the late 1980s, with a trough occurring in or around 1990, followed by stabilized and improving market conditions. Default rates are seen to correlate closely with market conditions as proxied by REIT prices.

High lifetime rates of default during the sample period suggest both large and systematic property value shocks. High default rates in the face of deteriorating market conditions further suggest low continuation values prior to 1992. The decline in default rates after 1991 coincides with improving market conditions, implying lower B (project value shock) and higher W (industry wealth) values and, hence, a movement into the loan continuation region depicted in Figure 2.

Table 5 documents that 289 loans were restructured and 342 loans were foreclosed in response to borrower default. The relatively high proportion of foreclosed loans may seem surprising, given the simple capital structures and relative transparency of commercial real estate assets. For example, Gilson, John, and Lang (1990) find restructuring is more likely when firms have more tangible assets, more bank debt, and simpler capital structures. The frequency of foreclosure outcomes is less surprising in the context of our model, which emphasizes noncontractable owner-manager investment, industry wealth effects, and asset inventory management by the lender.[15]

Restructuring–foreclosure decisions by year reveal the lender was more likely to foreclose defaulted loans when market conditions were deteriorating and default rates were increasing. Specifically, during the 1986–1990 time period, only 38% of the distressed loans were restructured, while

[15] Riddiough and Wyatt (1994) and Wang et al. (2002) also provide models that explain the coexistence of workout and foreclosure in mortgage markets. Riddiough and Wyatt focus on unobservable lender foreclosure costs and signaling with multiple borrowers to explain why a lender might prefer costly foreclosure outcomes. Wang et al. focus on borrower costs of default and screening costs incurred by the lender to distinguish between strategic and liquidity defaults.

Table 4
Defaulted Loans by Year of Origination and Year of Onset of Financial Distress

Year orig.	Number orig.	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
1974-81	1359	39	33	48	25	23	36	28	13	10	6	261
												19.2%
1982	68	13	0	1	1	0	0	0	1	0	0	16
												23.5%
1983	221	17	7	18	6	6	3	5	3	0	0	65
												29.4%
1984	147	10	8	23	0	5	11	3	2	0	0	62
												42.2%
1985	249	9	14	40	8	15	32	10	4	6	1	139
												55.8%
1986	188	2	14	12	7	18	24	13	6	2	0	98
												52.1%
1987	165	—	0	4	6	13	19	23	12	7	3	87
												52.7%
1988	111	—	—	0	2	6	23	9	7	1	6	54
												48.6%
1989	39	—	—	—	0	1	9	0	1	5	0	16
												41.0%
1990	42	—	—	—	—	0	6	0	3	0	0	9
												21.4%
Total	2589	90	76	146	55	87	163	91	52	31	16	807
		3.5%	2.9%	5.6%	2.1%	3.4%	6.3%	3.5%	2.0%	1.2%	0.6%	31.1%
REIT Price_t		113.4	113.6	107.6	108.1	91.3	99.2	104.8	128.4	122.8	121.9	

Table 4 displays lifetime and annual default rates over 1986–1995 for 2589 commercial mortgage loans originated by the lender. A total of 807 loans were classified as in default at some point during the period. The year of onset of financial distress is the year in which a loan was first reported as 90 days or more delinquent. Rows identify defaults by year of origination to determine a lifetime default rate. Columns identify the year in which a default occurred to provide an annual default rate. The indexed value of REIT price is shown in the last row, where the index value is 100 in 1985.

Table 5
Restructured versus Foreclosed Loans by Decision Year

Decision year	Number of restructured loans	Number of foreclosed loans	Restructuring rate
1986–1988	90	148	37.3%
1989	19	29	39.6%
1990	25	43	36.8%
1991	73	59	55.3%
1992	35	32	52.2%
1993	32	18	64.0%
1994	14	9	60.9%
1995	1	4	20.0%
Total	289	342	45.8%

Table 5 presents the number of defaulted loans that were restructured versus foreclosed by decision year. Decision year is the year in which a restructuring occurred or foreclosure proceedings were initiated. Restructuring rate is number of loans restructured in a year divided by the total number of restructured and foreclosed loans in that year. We combine years 1986–1988, because few loans were classified as restructured in 1986 and 1987.

Table 6
Foreclosures and Propensity to Sell Assets Out of Inventory

Year	Number of foreclosed loans	Number of properties sold	End-of-year inventory	Average ownership period	Propensity to sell foreclosed real estate
1986	36	0	36	n.a.	n.a
1987	45	2	79	7.9	5.6%
1988	32	4	107	17.1	5.1%
1989	46	27	126	27.3	25.2%
1990	41	17	150	30.3	13.5%
1991	70	19	201	21.3	12.7%
1992	71	24	248	19.6	11.9%
1993	41	79	210	31.3	31.9%
1994	24	85	149	27.4	40.5%
1995	6	13	142	26.5	8.7%
Total	412	270		27.3	18.7%

Table 6 documents foreclosure and foreclosed sales activity over 1986–1995. The average ownership period is in months, and the propensity to sell foreclosed assets is the number of properties sold in a year divided by the asset inventory at the prior year-end.

during 1991–1995, the restructuring rate increased to 56%. This difference is statistically significant at the 1% level.

Table 6 shows asset sale timing decisions conditional on loan foreclosure. There were 412 mortgage foreclosures during the sample period, with 270 foreclosed asset sales. Foreclosure activity peaked in 1991 and 1992, near the market trough in 1990–1991 (the data indicate it took 18 months on average to move from the onset of financial distress to loan foreclosure). Asset inventory peaked at year-end 1992, as foreclosure activity began to slow after 1992, and asset sales increased dramatically in 1993.

Asset sale propensities increased to over 30% in both 1993 and 1994, when we begin to see a stabilized and improving commercial real estate asset market with substantial amounts of liquidity injected by REITs and other opportunistic investors. Average ownership period data indicate that the properties sold in 1993 and 1994 were held in inventory for a relatively long time—31 and 27 months, respectively. This supports the idea that the lender waited until the sector recapitalized to sell assets that presumably would have been sold at depressed prices prior to 1993.

This evidence helps us address the time-varying restructuring–foreclosure relation noted in Table 5. With a weak market for foreclosed assets during the downturn, one might expect the lender to prefer restructuring over foreclosure. The data in Table 5 show the opposite occurred—foreclosure happened more often than restructuring. This result can be explained by endogenous borrower default. During a downturn, the distribution for B (the project value shock variable—see Figure 2) moves to the right, and it is not optimal for borrowers to continue to make the loan payments required to avoid foreclosure. As a result, a greater proportion of defaulted loans are foreclosed.

Later in the sample period, the lender restructured defaulted loans when default rates were declining and there appeared to be a ready market for foreclosed assets. Better market conditions imply that the distribution of B values moves inward, causing borrowers to prefer continuation over foreclosure. This results in a simultaneous drop in the default rate and increase in the restructuring rate as (1) more borrowers find it optimal to continue to make their payments, and (2) the borrowers that default often do so strategically because they anticipate restructuring.[16]

Other explanations for proportionally more loan restructuring when the market for distressed assets was stronger would require that the lender's relative gains from a restructuring increase for smaller B shocks. In our model, there is no direct relation between the lender's gain from restructuring versus foreclosure and the size of B. Liquidation occurs when the equity stake that an outsider is willing to contribute to the project exceeds the difference between the value of the asset run by the incumbent or by a less-skilled outsider. To put this another way, the project value shock is exogenous and, hence, common to all potential asset owners.

[16] This finding may be stronger than the results in the tables indicate, given the lag between the time a foreclosure decision is made and the ultimate sale of the asset. Specifically, the lender became more likely to restructure defaulted loans starting in 1991, while it did not greatly increase the sales of foreclosed assets until 1993. Given that the average ownership period for foreclosed real estate is over two years, it is entirely possible that, as real estate markets began to recover in 1991 and 1992, the lender decided to sell foreclosed assets, but the decision did not result in completed sales until some time later.

3.2 Lender Capital Expenditures on Foreclosed Properties

The data allow us to measure capital expenditures incurred by the lender during the foreclosed asset ownership period. Commercial real estate capital expenditures consist of major property maintenance expenses (such as replacing a roof), any redevelopment costs incurred to reposition the asset in the market, tenant improvements, and leasing commissions.

Capital expenditure and inventory ownership period data are presented in Table 7 by property type, original loan size, and foreclosure year. Monthly capital expenditures over the lender's foreclosed asset ownership period are first summed and then divided by the asset's sale price to produce a total capital expenditure percentage. Average total capital expenditures are 14.2% of the asset's sale price. The average ownership period is 2.3 years, which implies annualized capital expenditures of 6.2% on average. This compares to annual capital expenditures of 1.5 to 2.0% on average made by nondistressed owners of commercial real estate

Table 7
Lender Capital Expenditures on Foreclosed Property

Property type	Sample size	Total CapX as % of asset sales price	Ownership period (Months)	Annual CapX as % of asset sales price
Apartment	61	7.1%	22.1	3.9%
Hotel	12	14.4%	33.5	5.2%
Industrial	30	11.5%	23.9	5.8%
Office	124	19.6%	30.2	7.8%
Retail	38	11.8%	27.3	5.2%
Other	4	–1.7%	19.0	–1.1%
Total	269	14.2%	27.3	6.2%
Loan Size				
< $2 million	34	12.4%	24.9	6.0%
$2–$4 million	54	13.5%	22.9	7.1%
$4–$7 million	63	10.6%	26.0	4.9%
$7–$10 million	35	22.1%	30.3	8.8%
$10–$15 million	38	12.7%	31.7	4.8%
$15–$25 million	27	21.3%	32.0	8.0%
>$25 million	18	15.4%	26.7	6.9%
Total	269	14.2%	27.3	6.2%
Foreclosure year				
1986–1990	117	20.4%	38.4	6.4%
1991–1995	152	9.5%	18.7	6.1%
Total	269	14.2%	27.3	6.2%

Table 7 presents capital expenditures (CapX) made by the lender on 269 assets obtained through foreclosure that were subsequently sold (one observation was excluded due to missing data). Annual capital expenditure is defined as the total average capital expenditure percentage divided by the average ownership period in years. Data are reported for the entire sample as well as for six property type categories, seven original loan size categories, and two foreclosure-year periods. The negative capital expenditure reported in the Other property type category is due to a sizeable capital expenditure reserve that accompanied a foreclosed property, which proved to be more than sufficient to fund actual capital expenditures during the asset ownership period.

[Fisher et al. (2001)].[17] Thus, as a percentage of asset sales price, capital expenditures made by the lender on foreclosed assets were three to four times the level of capital expenditures made by nondistressed property owners.

The evidence shows that apartments (a low-shock sector) had relatively low levels of annualized capital expenditures, while office (a high-shock sector) had the highest levels of capital expenditure. By the year of foreclosure, total capital expenditures and time-in-inventory during 1986–1990 are more than double those in 1991–1995. These findings imply significant investment was required on foreclosed assets when market conditions were especially poor, while the lender also delayed sale of foreclosed assets until improvement in market conditions.

Lender capital expenditures on foreclosed assets thus provide direct evidence of underinvestment by financially distressed owners of commercial real estate, indicating that foreclosed assets arrive in poor condition.[18] The lender made additional capital expenditures for two possible reasons. First, consistent with model predictions, the financially distressed borrower may have deferred regular maintenance of the property before defaulting on the loan, knowing that the continuation value was low and the probability of foreclosure was high. This is consistent with the finding that underinvestment on foreclosed assets is more severe in large-shock sectors.

Second, changing market conditions might have made a large capital outlay necessary to reposition the property to maximize its value. Again, a financially distressed property owner would have limited incentives to make a significant investment in the property, as the benefits might be shared disproportionately with the lender. As evidence that capital expenditures were made to redevelop or reposition certain assets, of the 269 sold assets for which we have data, 67 incurred capital expenditures in excess of 20% of the asset sale price, 26 had capital expenditures in excess of 40% of the sale price, and 3 incurred costs in excess of 100% of the sale price.

These findings complement evidence presented in Asquith, Gertner, and Scharfstein (1994) that firms reduce their capital expenditures following financial distress. Our evidence of underinvestment is somewhat more direct, in that we observe the change in capital expenditures when the asset is transferred to a well-capitalized owner.

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[17] Fisher et al. (2001) study apartment property and find economic depreciation rates of 2.0% per year on average. Correspondence with William Wheaton indicates property types other than apartment have slightly lower annual rates of economic depreciation, somewhere in the 1.5 to 2.0% range.

[18] Some of the capital expenditures could be explained by inefficient investment decisions made by the lender, but it is doubtful that lender inefficiency could produce such a need for capital expenditures if there were no underinvestment by the borrower to begin with. It is also doubtful that the lender would repeatedly make capital expenditures on foreclosed assets once it recognized its own management inefficiency (that is, it would prefer to simply sell assets as-is to more efficient outsiders).

3.3 Firesale Discount Estimates

Our model suggests that depressed industry conditions will drive a wedge between fundamental asset value and the asset's sale price, and that the gap increases as sector wealth declines. Lender control of asset sale timing will partially mitigate the effect, but will not generally eliminate sales discounts, because the lender incurs significant inventory carrying costs. These costs consequently offset incremental expected gains from delay, suggesting that industry conditions at the *time of foreclosure* are largely responsible for time-varying sales discounts.

To measure these discounts, we compare the asset sale price to the *transfer value,* which is the lender's estimate of the asset's fundamental value at the time of foreclosure. Firesale discount estimates are adjusted to account for capital expenditures by the lender as well as for changes in general market conditions that occurred over the asset inventory holding period. Table 8 provides the results for the sample of 270 foreclosed asset sales.

The ratio of the asset sale price to the transfer value in column (2) is a relatively crude discount measure, without cost or market adjustments. Nonetheless, the data are informative, indicating that sales prices were approximately 25% lower than the transfer value on average over the entire sample period, and that discounts declined as a function of market conditions at the time of foreclosure.

Table 8
Firesale Discount Estimates on Foreclosed Asset Sales

Foreclosure Year	Number of sold assets (1)	Asset sale price / transfer value (2)	Asset sale price / (TV + CapX) (3)	Adjusted asset sale price / (TV + CapX) (4)	Time to Asset sale (months) (5)
1986	16	0.690	0.611	0.661	53.9
1987	24	0.688	0.631	0.672	40.4
1988	24	0.757	0.691	0.799	39.9
1989	29	0.751	0.674	0.821	40.3
1990	24	0.778	0.713	0.877	29.4
1991	49	0.670	0.623	0.780	28.7
1992	52	0.777	0.734	0.829	16.9
1993	34	0.783	0.759	0.781	10.2
1994	16	0.986	0.970	0.970	4.2
1995	2	1.155	1.132	1.276	6.7
Total	270	0.756	0.705	0.801	27.3

Table 8 reports various estimates of the firesale discount associated with foreclosed assets that were sold during the sample period. Transfer value (TV) is the lender's estimate of the asset's fundamental value at the time of foreclosure. CapX in columns (3) and (4) is the present value of capital expenditure incurred over the asset holding period, discounted to the foreclosure date at 10%. For the one observation with missing CapX, we use the annual sample average together with actual holding period data. The adjusted asset sale price in column (4) is the asset sale price adjusted for changes in the NCREIF property index. This adjustment controls for changes in market conditions realized over the asset holding period.

In column (3) we adjust the transfer value by adding in the present value of capital expenditures incurred by the lender over the asset holding period. To obtain a present value, we discount annual expenditures incurred over the holding period at 10% to the date the asset is transferred to inventory.[19] Inclusion of capital expenditures in the denominator of the sale price–acquisition value ratio increases the estimated firesale discount to 30% on average.

A fully adjusted estimate of the firesale discount is provided in column (4). Using NCREIF property index data, we adjust individual sales prices to account for marketwide changes in asset prices realized over the inventory holding period. Because market-wide asset values generally declined over the inventory holding periods, an upward adjustment in the asset sales price tends to occur to reduce the estimated firesale discount. With this final adjustment, the data suggest that distressed commercial real estate assets that were obtained through foreclosure by the lender were sold at an average 20% discount to their fundamental values.[20]

As the model predicts, the extent of the estimated discount varies systematically as a function of market conditions at the time of foreclosure. Discounts of roughly 30 to 35% were realized toward the beginning of the market downturn, declining to the 20% range during the middle years of the sample period as the market bottomed out and began to recover. Firesale discounts effectively disappeared in 1994 and 1995, when significant liquidity returned to the market.

This time series pattern is very similar to that documented by Pulvino (1998), and as predicted by Shleifer and Vishny (1992). Also, as noted early, the time to asset sale varies directly with the cycle, with longer holding periods associated with poorer market conditions.

4. Regression Analysis

In this section we use detailed loan data on restructuring–foreclosure decisions as well as on foreclosed asset sale outcomes to assess the model's comparative static predictions. Because the model is based on backward induction, we present the stage-3 (foreclosed asset sale timing) model

[19] Measured returns to privately held commercial real estate assets are typically in the 8 to 10% range.

[20] There are other possible adjustments that might be made. For example, we presume realized market value adjustments are in line with market value changes expected by the lender at the time of foreclosure. We suspect that expected value changes exceeded realized changes for most of the sample period. We also do not attempt to account for the positive NPV increment associated with capital expenditures, implicitly assuming that cost equals value. These adjustments would increase the estimated firesale discount. In the other direction, we ignore asset depreciation realized over the holding period, and focus only on capital expenditures. Our judgment is that the net effect of these adjustments is probably small. An additional possible effect could be a systematic bias in the transfer value, which is the estimate of the property's market value at the time of foreclosure.

specification and results first, and then analyze the stage-2 (restructuring versus foreclosure decision) outcomes.

4.1 Timing Decision to Sell a Foreclosed Asset

Data on foreclosed asset sales allow for tests of predictions of the third stage of the model. To do this, we specify a proportional hazards model of the time to asset sale. The model relies on foreclosure data from assets that sold during 1986–1995 to estimate the probability of an asset sale in a particular quarter. The probabilities implied in the coefficient estimates thus provide a way to assess model predictions. Cross-sectional and time-varying proxies for sector wealth, as well as variables that control for other factors that may influence the time required to sell an asset, are the explanatory variables.

The model predicts that the lender takes longer to sell a foreclosed asset under conditions of low sector wealth, W. That is, foreclosed assets are predicted to sell quickly when W is above a critical value at the time of default, but sale is delayed until W increases when sector wealth is below the critical value. We begin by assuming that the natural buyers of distressed commercial real estate—i.e., the most efficient managers (those with the lowest β_2 values)—are current commercial real estate owner-managers. They are likely to have experience in owning and managing property types like those they are interested in buying. Property type thus proxies for cross-sectional variation in sector wealth, in the sense that higher-shock sectors are predicted to experience longer times to asset sale.

REIT index prices are a natural time-varying proxy for the wealth of commercial real estate managers. Seasoned real estate professionals used REITs in the early to middle 1990s to access capital and purchase discounted assets, suggesting that access to liquidity was capitalized into REIT prices during that time. Higher REIT prices indicate greater wealth available to natural real estate buyers, and therefore are predicted to cause faster times to sale.

We also include variables that measure the management specificity of the foreclosed asset. The market is thinner for management-specific assets, implying that it should take longer to match buyers and sellers, whatever the potential buyer wealth. Hotel property is considered to be more management-intensive than the other property types and, therefore, is predicted to take longer to sell. Estimated asset value at the time of foreclosure (the asset's transfer value) is also a proxy for management specificity, in that larger assets typically require greater management expertise. They also require more capital for acquisition purposes. Larger assets are therefore hypothesized to result in a slower rate of asset sale.

Three control variables are also included in the model specification. A bankruptcy dummy variable indicates whether the foreclosed asset was included as part of a broader bankruptcy action. A package sale dummy variable indicates whether the asset was bundled together with other assets as part of a bulk sale. Finally, a purchase money dummy variable indicates whether the lender provided debt financing as part of the asset sale.

Estimation results are reported in Table 9. The REIT price coefficient is positive and statistically significant, implying that greater sector wealth shortens time to sale. Apartments spend less time in inventory than office properties. This is as expected, since the apartment property sector experienced the mildest shock to fundamentals, with a deeper pool of well-capitalized potential buyers. Neither the hotel nor the transfer value variable coefficients is statistically significant. The hotel property finding may have been influenced by its slightly less severe shock relative to office property, which has the effect of reducing time in inventory.

The bankruptcy dummy variable coefficient is positive and statistically significant, indicating faster times to sale than the baseline. We believe this result follows from two possible effects: (1) bankruptcies often involve borrower issues other than those specific to the foreclosed asset, implying that sample assets that are part of a bankruptcy proceeding might be of higher quality than average and hence easier to sell, or (2)

Table 9
Test of Stage-3 Model Predictions: Lender's Inventory Asset Sale Decision

Independent variable (model variable reference)	Coefficient estimate (standard error)
Apartment (W)	0.808*** (.190)
Hotel (W,β)	–0.114 (.330)
Industrial (W)	0.397* (.231)
Retail (W)	0.170 (.196)
Other (W)	0.675 (.514)
Transfer value (W,β)	–0.010 (.009)
REIT price (W)	0.020*** (.003)
Bankruptcy (control)	0.649*** (.242)
Package sale (control)	–0.257* (.139)
Seller financing (control)	–0.107 (.225)
Model chi-square	79.1***

Table 9 reports coefficient estimates from a proportional hazards model of the time to repossessed asset sale. The dependent variable takes on a value of 1 if the repossessed asset is sold during a particular quarter and zero if the repossessed asset remains in the lender's inventory. The sample includes only foreclosed assets that were actually sold by the end of the 1995. Sample size is 241, as 29 observations were excluded due to missing values. Standard errors for the estimated coefficients are in parentheses. Asterisks indicate statistical significance based on the Wald chi-square measure: *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. Several additional variables are included as controls in the specification: a bankruptcy dummy variable, indicating if the loan was part of a larger bankruptcy proceeding; a package sale dummy variable, indicating if the asset sale was part of a bulk (multi-asset) sale transaction; and a seller financing dummy variable, indicating whether the lender provided purchase money financing as part of the asset sale transaction.

bankruptcy causes delays in the ability to foreclose, implying that bankrupt assets arrive later in the cycle when there already have been significant delays, and with a lender that is eager to sell quickly. The package sale dummy variable coefficient is negative and weakly significant, indicating slower times to sale. Package deals often include assets of lower quality, suggesting longer times to sale. Package sales are also often complex to execute and evaluate, and harder to negotiate. The purchase money variable coefficient is insignificant.[21]

The hazard model results are thus generally consistent with third-stage model predictions. Asset sale timing varies as a function of sector wealth in ways predicted by the model, which complement the findings of Pulvino (1998) and Brown (2000), who examine the transacted prices of distressed assets.

4.2 Decision to Restructure versus Foreclose a Distressed Loan

The model structure predicts that default resolution depends on the extent of the shock to project fundamentals, B, the extent of asset management specificity, $\beta_2 - \beta_1$, and the wealth levels of outside buyers, W.

Property type is used to proxy for variation in the depth of the project value shock. Apartment property is a low-shock sector compared to other property types, which, after accounting for the effect of endogenous borrower default, predicts a higher likelihood of restructuring.

The lender's inventory of foreclosed assets is a compelling proxy for potential buyer wealth, W, as distinct from the asset-level shock, B. Model predictions and previous evidence indicate that, when the lender holds a large inventory of foreclosed assets, the market for distressed assets is weak. Thus, higher relative levels of asset inventory imply lower industry wealth and thus an increased propensity to restructure.

REIT prices proxy for the wealth levels of potential buyers, as distinct from project value shock effects. We have noted that growth opportunities associated with the purchase of discounted assets (access to liquidity) were capitalized into REIT asset prices during the sample period. Higher REIT prices thus imply greater sector wealth, which in turn is predicted to increase the likelihood of foreclosure.

The model also predicts that assets that are more management-specific ($\beta_1 << \beta_2$) are less likely to be foreclosed. Because larger assets and hotel properties are more complex and manager-specific, we expect the probability of foreclosure to be negatively related to initial loan size and the hotel property indicator variable.

A number of control variables are included in this specification. The loan-to-value ratio, debt service coverage ratio, and loan term at the time

[21] Our main results are robust in that inclusion of the three control variables does not affect the signs or the statistical significance of the other variables in the model specification.

of issuance are included to control for differences in contracting and financial structure. Loan age at the time of default is included to control for seasoning that affects the equity position in the asset. We also have information as to borrower type, whether individual, partnership, or other. We indicate whether the loan was domiciled in a judicial foreclosure or a power-of-sale state, where judicial foreclosure is typically more time-consuming. A second mortgage indicator variable is also included, as in a few cases subordinated debt was used in addition to the first mortgage held by the lender. Finally, we include a bankruptcy indicator variable.

The lender's propensity to foreclose versus restructure a defaulted commercial real estate loan is estimated using a logit model, with results reported in Table 10. The model is estimated for 631 financially distressed loans, where the independent variable takes a value of 1 if the loan was foreclosed (342 observations) and 0 if it was reorganized (289 observations).

The coefficient on the apartment property dummy variable is negative and statistically significant. The combined result that (1) a small proportion

Table 10
Test of Stage-2 Model Predictions: Lender's Restructuring versus Foreclosure Decision

Independent variable (model variable reference)	Coefficient estimate (standard error)
Intercept	–1.31 (2.02)
Apartment (B)	–1.25*** (.238)
Industrial (B)	–0.202 (.318)
Retail (B)	0.013 (.304)
Other (B)	–0.115 (.787)
REIT price (t) (W)	0.009* (.005)
Beginning inventory (t) (W,K)	–0.013*** (.002)
Hotel (β)	–1.41*** (.482)
Loan size (β)	–0.022*** (.007)
Loan-to-value ratio (control)	0.015 (.0200)
Debt service coverage ratio (control)	0.954 (0.716)
Loan term (control)	–0.003 (.003)
Loan age (control)	0.029 (.047)
Borrower type–individual (control)	–0.035 (.430)
Borrower type–partnership (control)	–0.156 (.251)
Borrower type–other (control)	–0.055 (.367)
Judicial sale (control)	0.406** (.203)
Second mortgage (control)	–0.394* (.220)
Bankruptcy (control)	0.317 (.375)
Model chi-square	117.9***

Table 10 presents logit model coefficient estimates of the lender's decision whether to restructure (0) or foreclose (1) a defaulted commercial mortgage loan. A total of 289 restructured loans and 342 foreclosed loans are analyzed. Standard errors for the estimated coefficients are in parentheses. Asterisks denote statistical significance based on the chi-square score measure: *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. Several additional variables are included as controls: loan-to-value ratio at loan origination; debt service coverage ratio at loan origination, defined as net operating income divided by debt service; loan term-to-maturity at origination; loan age at the onset date of financial distress; borrower type–individual, borrower type–partnership, borrower type–other; a dummy variable indicating if judicial sale (as opposed to power-of-sale) foreclosure law applies; a second mortgage dummy variable, indicating if the borrower had a secondary source of debt financing; and a bankruptcy dummy variable, indicating if the loan was part of a larger bankruptcy proceeding.

of apartment loans were foreclosed when the shock to the apartment sector was smaller, and (2) foreclosed apartment properties were readily sold out of inventory, is consistent with the idea that few apartment property owners found the value shock to be great enough to default when they anticipated that the lender would foreclose. Instead, the defaults that did occur were more likely to be strategic (i.e., in anticipation of restructuring).

The coefficient on the beginning-period inventory variable is negative and significantly different from zero at the 1% level. The lender is more willing to restructure a distressed loan when the market for foreclosed property is weak, as evidenced by a large beginning-period inventory of foreclosed property. This also implies that the lender took into consideration the expected payoffs of carrying an asset in inventory when it made its decision to restructure versus foreclose.

The REIT price variable (a proxy for time-varying wealth effects) is positive and significant. This is consistent with model predictions, in the sense that a higher-B/higher-W combination is predicted to result in a foreclosure, while a lower-B/lower-W combination is predicted to result in a restructuring. This relation is unlikely to be explained by the models of Habib and Johnsen (1999) and Stromberg (2000), which predict that defaulted loans are more likely to be liquidated because the incumbent managers are less capable.

The hotel and loan size variables proxy for asset management specificity. The coefficients on both variables are negative and statistically significant. This supports the idea that incumbent owner-managers are generally more skilled than outside investors at operating the asset, and therefore, that the investment distortion–outsider wealth tradeoff is relevant for a lender in considering whether to restructure or foreclose.

Of the control variables, only the judicial state dummy and the second mortgage dummy variable coefficients are statistically significant. The positive coefficient on the judicial dummy indicates a propensity to choose foreclosure over workout. This result is somewhat puzzling, as one would assume that a more bureaucratic foreclosure process might be more costly, causing the lender to prefer workout over foreclosure. Perhaps this expected cost is priced at the time of debt issuance, imposing an additional financial burden that increases the borrower's willingness to walk away from the investment. The second mortgage dummy has a weakly significant negative coefficient, suggesting that a more complex capital structure prompts a preference for restructuring. This is consistent with Gilson et al. (1990), who find that liquidations are less frequent when the firm's preexisting capital structure is more complicated.[22]

[22] As with stage-3 estimation results, the crucial relations in this section that involve B, W, and β are robust to the exclusion of the control variables.

The logit model estimation results support predictions of the model. Evidence suggests that default decisions by borrowers are endogenous and depend critically on the size of the shock to project fundamentals, and the lender considers the wealth and relative management skills of potential buyers in the restructuring–foreclosure decision.

5. Conclusion

Several key elements drive our model of financial distress with an owner-managed project. First, a project-level shock causes financial distress and a debt overhang problem. The lender is forced to either forgive some debt through a restructuring, in order to restore proper investment incentives, or foreclose. Restructuring is more attractive when there is significant going-concern value in the project and when the pool of buyers for the foreclosed asset is thin and wealth-constrained. Because the lender cannot capture much of the gains from a restructuring, foreclosure is increasingly preferred with increasing wealth and efficiency of outside buyers. These features explain the presence of both restructuring and liquidation outcomes in the data, and why transparent and simply capitalized owner-managed firms are frequently liquidated in financial distress.

If the borrower anticipates that default will lead to debt forgiveness, it opts to strategically default. If the borrower anticipates that the defaulted loan will be foreclosed, default occurs only when the project's continuation value (equity position) is less than the cost of keeping the loan current. Thus, the extent of the shock to project value and the market for foreclosed assets interact to determine whether the borrower defaults as well as the outcome of default.

Asset value is endogenous in our model, as owner-manager investment is endogenous and industry market conditions vary to affect the realized sales price of foreclosed assets. We thus reference and extend the model of Titman et al. (2004), which considers underinvestment with nondiscretionary liquidation as an explanation for endogenous asset values and borrower default decisions.

Our approach also extends Shleifer and Vishny's (1992) model of financial distress when an entire industry experiences liquidity problems. In their model, an adverse shock to asset value occurs, followed by default and liquidation. The asset is sold at a firesale price to a less productive outside investor, where the magnitude of the firesale discount depends on the depth of the industry-wide economic shock. Our model encompasses these elements, with the additional features that borrower default is endogenous, the lender has discretion to restructure or liquidate, and the lender chooses when to sell foreclosed assets to outside investors. This additional structure provides further insight into both the causes

and consequences of financial distress, as well as the lender's role in liquidity provision in the market for distressed real assets.

A unique prediction of our model is that, although a lender might unconditionally prefer to restructure when market conditions are deteriorating, endogenous borrower default can reverse the realized outcomes. We see such a reversed pattern of restructuring–foreclosure outcomes in a unique data set of financially distressed commercial real estate loans that correspond with a severe market downturn and subsequent recovery. Detailed data on the lender's restructuring–foreclosure decision and its foreclosed asset sale timing decision are used to test model implications. The data support many of the predictions of the model, including the existence of endogenous borrower default, significant underinvestment in foreclosed assets, liquidity provision in the form of delayed asset sales in response to weak industry conditions, and firesale discounts that vary depending on market conditions at the time of foreclosure.

Appendix

Proofs of Propositions

To prove the propositions, we will consider the more general case of a distressed borrower that is allowed to have personal wealth available to contribute to a restructuring. The incumbent's personal wealth is denoted W_I.

Proof of Proposition 1 (Restructuring–Foreclosure Decision)

The lender is assumed to hold an auction for a foreclosed asset. The distressed incumbent can obtain outside financing from another lender or renegotiate with the current lender. In either case, the maximum amount that the distressed borrower is willing to pay for the asset follows directly from Equations (4) and (5). Specifically, the incumbent manager is willing to pay up to $W_I + (V - B)^2 / 8\beta_1$ for the asset, assuming a participation constraint is binding. Thus, the condition necessary for the asset to be sold to an outsider is

$$W + (V - B)^2/8\beta_2 > W_I + (V - B)^2/8\beta_1. \tag{A.1}$$

This result is very similar to the expression in Equation (6), and assuming the participation constraint is satisfied for the incumbent [i.e., Equation (7)], an outside buyer is willing to pay more for the asset than the lender's payoff in a restructuring if

$$W \geq \underline{W} = \text{Max}\left\{W_I + \left(\frac{(V - B)^2}{8}\right)\left[\frac{1}{\beta_1} - \frac{1}{\beta_2}\right], 0\right\} \tag{A.2}$$

Thus, in this general setting, foreclosure occurs when Condition (A.2) holds. That is, foreclosure occurs when there is enough of a *difference* between the potential buyer's wealth and the distressed owner-manager's wealth to overcome the relative inefficiency of the outside manager. In this case, it is possible for an inefficient but well-endowed incumbent to outbid a more efficient but relatively wealth-constrained outside buyer.

When the distressed owner-manager has wealth, it may be required to contribute some of it to a restructuring to win the auction. In other words, W_I is endogenous in the sense that

the distressed owner-manager may vary its equity contribution depending on competitive industry conditions.

If Condition (A.2) does not hold, the distressed borrower must contribute W* in a restructuring to win the auction where

$$W^* = \text{Max}\{0, (V - B)^2/8\beta_1 - W - (V - B)^2/\beta_2\} \tag{A.3}$$

The major implications of this general case as compared to the $W_I = 0$ case are that (1) restructurings are more likely, and (2) the lender captures a greater share of the rents in a restructuring.

Proof of Proposition 2 (Foreclosure with Potential for Delayed Sale)

We will first prove that $\bar{W} < \tilde{W}$. Recall that $\tilde{W}$ is the value of W such that $W_{t+1} - K = W$, and that $\bar{W}$ is the value of W such that $W_{t+1} - K = \underline{W}$. Given the assumptions from Equations (1) through (3), because W is less than $\underline{W}$ at $W_{t+1} - K = \underline{W}$, it must be that $\bar{W} < \tilde{W} < \tilde{W}$. Furthermore, W less than $\bar{W}$ implies that $W_{t+1} - K < \underline{W}$, which altogether establishes the three regions claimed in the proposition.

Figure 4 displays outcomes for the three cases discussed in the section. Case A corresponds to $\tilde{W} < \underline{W}$ (foreclosure-delayed sale never occurs); case B corresponds to $W_{t+1} - K > \underline{W}$ for all W (restructuring never occurs); and case C is the intermediate case presented in Proposition 3 in which all three outcomes are possible (restructuring, foreclosure-delayed sale, foreclosure-immediate sale). The heavy line arrows indicate different restructuring–foreclosure outcome regions as a function of W in case C. Outcomes for the three cases as a function of W are summarized as follows:

Case A: $W < \tilde{W}_A$, restructure; $W > \tilde{W}_A$, foreclose-immediate sale.

Case B: $W < \tilde{W}_B$, foreclose-delayed sale; $W > \tilde{W}_B$, foreclose-immediate sale.

Case C: $W < \bar{W}_C$, restructure; $\bar{W}_C < W < \tilde{W}_C$, foreclose-delayed sale, $W > \tilde{W}_C$, foreclose-immediate sale.

Proof of Proposition 3 (Borrower's Default Decision)

The borrower defaults when the payoff from continuation is less than the payoff in default. The borrower's payoff from continuation is

$$\rho(P_1)[V - B - P_1] - P_0 - C(\rho(P_1)) \tag{A.4}$$

If the borrower defaults, the lender can either foreclose, which results in a zero payoff to the borrower, or restructure. The borrower anticipates that foreclosure will occur when Equation (A.2) is satisfied. Thus, the borrower defaults when foreclosure is anticipated for all B greater than B* where

$$\rho(P_1)[V - B^* - P_1] - P_0 - C(\rho(P_1) = 0 \tag{A.5}$$

Solving Equation (A.5) for B* results in the condition for default when foreclosure is anticipated, as indicated in Proposition 3.

When $W_I > 0$, the borrower has wealth to contribute to a restructuring. The condition presented in Proposition 3 does not depend on the level of incumbent wealth, because neither the owner-manager's payoff in continuation nor foreclosure depends on W_I. Payoffs from a restructuring do depend on W_I and W, however. When $W_I = 0$, the debt is restructured to a level F_1*. Since F_1* is less than P_1, it is always the case that the borrower defaults when the borrower anticipates a restructuring.

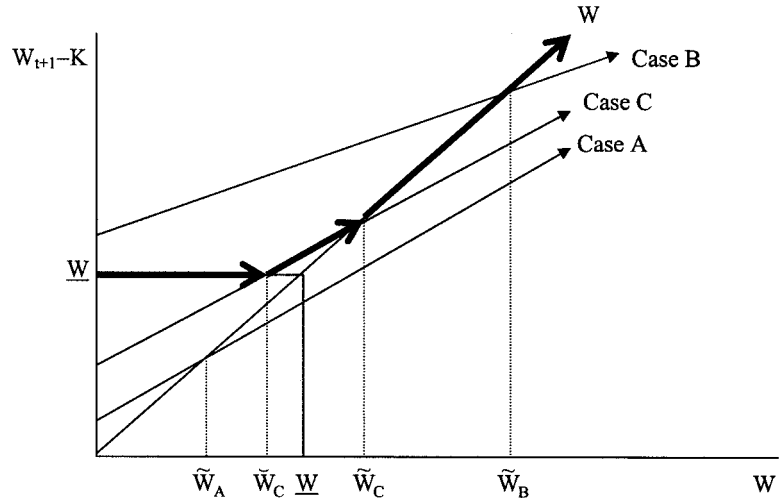

Figure 4
Outcomes for the three cases as a function of W
The relation between the wealth of the outside buyer at the time of default, W, and the wealth of the outside buyer in one period following default, W_{t+1}, in three cases. In Case A foreclosure-delayed sale never occurs. In Case B restructuring never occurs. All three outcomes occur in Case C: restructuring for low values of W, foreclosure-delayed sale for intermediate values of W, and foreclosure-immediate sale for high values of W.

When W_I is positive, the payoffs in a restructuring may be reduced, because the distressed borrower must contribute some funds, as shown in Equation (A.3). Thus, the borrower does not default for all realizations of B, implying the shock must be sufficiently large for restructuring to dominate continuation. A smaller shock (smaller than B*) is required to trigger default when restructuring is anticipated than when foreclosure is anticipated, since borrower payoffs are greater than zero in a restructuring.

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