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Author(s): Efraim Benmelech, Mark J. Garmoise and Tobias J. Moskowitz

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# DO LIQUIDATION VALUES AFFECT FINANCIAL CONTRACTS? EVIDENCE FROM COMMERCIAL LOAN CONTRACTS AND ZONING REGULATION\*

EFRAIM BENMELECH  
MARK J. GARMAISE  
TOBIAS J. MOSKOWITZ

We examine the impact of asset liquidation value on debt contracting using a unique set of commercial property loan contracts. We employ commercial zoning regulation to capture the flexibility of a property's permitted uses as a measure of an asset's redeployability or value in its next best use. Within a census tract, more redeployable assets receive larger loans with longer maturities and durations, lower interest rates, and fewer creditors, controlling for the property's type, sale price, and earnings-to-price ratio. These results are consistent with incomplete contracting and transaction cost theories of liquidation value and financial structure.

## I. INTRODUCTION

How do liquidation values affect financial contracts? An extensive theoretical literature [Williamson 1988; Harris and Raviv 1990; Aghion and Bolton 1992; Shleifer and Vishny 1992; Hart and Moore 1994; Bolton and Scharfstein 1996; Diamond 2004] argues that optimal debt policy critically depends on how costly it is for creditors to seize and liquidate assets. Empirical evidence on this question is scarce, however, due to the difficulty in obtaining a measure of an asset's liquidation value or value in its next best use. We provide empirical evidence on the link between liquidation value and debt contracts using a unique sample of commercial property loans and variation in property zoning ordinances.

Liquidation value is of central importance for financial deci-

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sions when contracts are incomplete and transaction costs exist. In particular, debt contracts allow the creditor to seize the debtor's assets when the latter fails to make a promised payment. Since the debtor cannot commit to not withdraw his human capital from the project (as in Hart and Moore [1994]), or to not divert cash flows to himself (as in Aghion and Bolton [1992]), creditors will agree to lend only if the debt is secured by the project's assets and default triggers its liquidation.

Testing these theories requires that the econometrician observe the liquidation value of the asset, but it is difficult to ascertain *ex ante*, when the parties enter the debt contract, what the proceeds from selling the asset to the next user might be. As a proxy for the *ex ante* value of the asset in its next best use, we employ property-specific zoning assignments to capture micro-level variation in liquidation values.

The real estate market is a natural candidate for testing financial contracting from an incomplete contracting perspective. First, the loans are typically secured and nonrecourse, thus providing a set of project-specific financings and characteristics consistent with the inalienability of human capital described by Hart and Moore [1994] and other models. Second, debt levels in commercial real estate are typically very high at initiation (median of 82 percent of value). Thus, it is plausible that the financing provided is closer to the maximal leverage or project debt capacity the lender will tolerate, which is closer to the underlying theories. Finally, the real estate market offers a potential measure of an asset's liquidation value through zoning ordinances which govern the permitted uses of a property.

This empirical approach is motivated by Shleifer and Vishny's [1992] argument that a broader set of buyers can potentially raise the liquidation value of an asset. Zoning regulations determine the set of uses of a property. Properties with more allowable uses should have a greater number of potential buyers, all else equal, and therefore a higher value in the event of liquidation. A property's zoning designation is thus a measure of its *redeployability* in the sense of Williamson [1988].

We recognize that the current market price of the asset is also likely to be affected by redeployability and, more specifically, zoning, which, along with the financing environment, may be jointly determined by local market unobservables [Glaeser and Gyourko 2003; McMillen and McDonald 2002]. Endogeneity con-

cerns of this type are less relevant for our study for several reasons. First, the zoning code is set at the jurisdiction or city level. We examine property-specific zoning assignments *within* a census tract, where census tract fixed effects difference out unobservable neighborhood effects such as local market conditions, quality, or degree of bank redlining at a level finer than the local zoning code or the typical lending market (see Berger, Demsetz, and Strahan [1999], Petersen and Rajan [2002], and Garmaise and Moskowitz [2004, 2005]). Second, to distinguish the importance of collateral value from the current market value or profitability of the property, we focus on the characteristics of the debt contracts controlling for the sale price and capitalization rate (income divided by price) of the property, to attempt to isolate the component of redeployability related to the asset's secondary or liquidation value. The price and cap rate likely soak up other quality differences within a census tract that may be unrelated to collateral value.

We find that, controlling for the property's price, earnings-to-price ratio, type, general zoning, year, and census tract, greater redeployability is associated with larger loans, lower interest rates, longer maturity and duration debt, and fewer creditors. Moving from the least to the average (most) zoning flexibility lowers the interest loan rate by 27 (58) basis points per annum, increases the loan's size relative to the value of the property by 1.9 (4.1) percentage points, lengthens the loan's maturity by 1.1 (2.3) years, increases duration by 0.2 (0.5) years, and decreases the probability of borrowing from multiple lenders by 4.0 (8.5) percentage points. Including bank or buyer fixed effects in addition to census tract fixed effects to further difference out unobservables related to the lender or borrower, we find quantitatively similar effects.

In addition, our redeployability measure has a significantly larger impact on loan contracts in states in which foreclosure is relatively easy, suggesting that it is the effect of zoning on the asset's liquidation value that is driving our results, since only collateral value is relevant in foreclosure. We also find the effect of our zoning redeployability measure to be magnified in districts in which survey evidence suggests that zoning rules are administered more strictly and where local market liquidity is higher.

We also employ another measure of liquidation value using "historical" zoning districts, which are quite restrictive and in-

flexible. We find that historic-zoned properties receive significantly fewer, smaller and shorter duration loans, are financed at higher interest rates, and are more likely to be financed by multiple creditors. Since it is also more difficult to obtain zoning changes within historic districts, we interact our redeployability measure with the historic designation and find that redeployability has an even greater effect on loan terms in historic areas.

Finally, since the current price of the property should be a function of liquidation value, we also show that more redeployable properties enjoy higher market prices. While we interpret this result with caution due to greater endogeneity concerns, it is consistent with flexibility-of-zoning capturing liquidation value.

Previous research has analyzed some of the implications of incomplete contracting for financial structure, but has not focused on liquidation value, which plays a prominent role in the theory [Baker and Hubbard 2003, 2004; Kaplan and Stromberg 2003; Gilson 1997]. The existence of inefficient liquidation or “fire sales” has been documented [Pulvino 1998, 1999; Stromberg 2000], but not the interplay between *ex ante* liquidation value and financial structure at the time the contract is set. Other studies examine the relation between balance-sheet figures such as tangibility (e.g., the ratio of fixed assets to total assets) and capital structure, [Braun 2003; Harris and Raviv 1991; Rajan and Zingales 1995], but it is not clear that such proxies either capture liquidation value or represent total debt capacity. Benmelech [2005] analyzes the relation between asset salability and capital structure among nineteenth century American railroads, finding a link to debt maturity, but not leverage.

In addition, we provide novel micro-level evidence on the relation between liquidation value and number of creditors that complements cross-country studies of lending relationships and creditor protection [Ongena and Smith 2000; Esty and Megginson 2003; Detragiache, Garella, and Guiso 2000].

The rest of the paper is organized as follows. Section II summarizes theoretical predictions on the relation between liquidation value and financial contracting. Section III describes the commercial loan data, local zoning regulations, and our empirical strategy to measure changes in liquidation value through zoning laws. Section IV presents the empirical results, and Section V concludes.

## II. LIQUIDATION VALUE AND FINANCIAL CONTRACTS

The value of the creditor's option to liquidate project assets affects both his willingness to provide financing and the terms on which financing is extended. The concept of *liquidation value* used in Harris and Raviv [1990], Hart and Moore [1994], and Bolton and Scharfstein [1996] is fairly general: an asset's liquidation value is the amount that creditors can expect to receive if they seize the asset from managers and sell it on the open market. Williamson [1988] and Shleifer and Vishny [1992] analyze two different components of liquidation value. Williamson, in his transactions cost approach, focuses on an asset's *redeployability* (i.e., its value in alternative uses). Shleifer and Vishny's industry-equilibrium model suggests that assets with few potential buyers, or with potential buyers who are likely to be financially constrained when a firm attempts liquidation, will be poor candidates for debt finance, since liquidation is likely to yield a low price. In these models, project financing is highly influenced by the value of the collateral in the creditor's hands.

The following are some of the central empirical predictions arising from these models.

**PREDICTION 1.** Debt levels increase in asset liquidation value.

This general prediction emerges from Williamson [1988], Shleifer and Vishny [1992], Harris and Raviv [1990], and Hart and Moore [1994]. Debt triggers liquidation in some states in all these models, and the benefits of debt are tied to the efficiency of liquidation. This prediction applies to the total debt capacity the lender is willing to supply. Empirically, the equilibrium debt level is typically observed, which, all else equal, is increasing in debt capacity. In the commercial real asset market, debt levels at initiation are quite high, which suggests that they may be closer to the maximal leverage or debt capacity the lender will tolerate.

**PREDICTION 2.** The promised debt yield decreases in asset liquidation value, controlling for the debt level.

Following Prediction 1, increased liquidation value lowers the cost of liquidation. In equilibrium, lenders therefore charge lower interest rates on loans made on assets with higher liquida-

tion value, controlling for the debt level. This is in part why optimal debt levels also rise (Prediction 1).<sup>1</sup>

PREDICTION 3. Debt maturity increases in asset liquidation value.

Prediction 3 emerges from Hart and Moore [1994] and from Shleifer and Vishny [1992]. Hart and Moore argue that a higher profile of liquidation values over time increases the asset's durability and makes longer maturity debt feasible. Shleifer and Vishny analyze the trade-off between the benefit of debt overhang in constraining management and liquidation costs. Since, as Benmelech [2005] shows, higher liquidation values make overhang (long-term) debt more attractive, Shleifer and Vishny thus predict an increase in debt maturity with liquidation value. Although some of these theories only consider zero-coupon debt, a reasonable extrapolation yields the implication that debt *duration* will also increase in liquidation value.

PREDICTION 4. Firms borrow from multiple creditors when liquidation value is low and from a single creditor when liquidation value is high.

This is a prediction of Bolton and Scharfstein [1996] and Diamond [2004]. Multiple creditors provide discipline at the cost of inefficient liquidation.

PREDICTION 5. The current market value of the asset is increasing in its liquidation value.

Since the liquidation value of the asset is a component of its overall value, increasing the liquidation value increases current total asset value [Harris and Raviv 1990].

## II.A. Application to Commercial Real Assets

In order to test these implications, we employ a unique data set of commercial property transactions and financial contracts and use property-specific zoning assignments to capture variation

1. Unconditionally, an increase in the liquidation value of the asset raises the optimal debt level but also provides a greater payment to creditors. The net effect on promised debt yields is analytically ambiguous, but in numerical results Harris and Raviv [1990] show that firms with higher liquidation values consistently have higher debt yields. Controlling for the debt level of the firm, by contrast, higher liquidation values should be associated with *lower* promised yields, since creditors can expect a higher payment in the case of default.

in liquidation value. Some discussion of the relation between the data and the models is in order.

Commercial property loans are secured, highlighting the potential importance of liquidation value, and are typically nonrecourse [Stein 1997].<sup>2</sup> The lender may only pursue the collateral, in this case the property, and not any other assets of the borrower in case of default.<sup>3</sup> Examining variation in financial contracts within a particular asset class also helps by reducing heterogeneity in control issues, cash flow rights, risk, or industry competitiveness that may arise when examining contracts across vastly different assets, projects, or investments. Finally, we argue in the next section that property-specific zoning assignments within a census tract can capture micro-level variation in liquidation values used to test the predictions of the models.

### III. DATA AND EMPIRICAL STRATEGY

We briefly describe the data sources used in the paper and our identification strategy for capturing asset liquidation value.

#### *III.A. Transaction and Financing Level Data of Commercial Real Assets*

Our sample consists of commercial real asset transactions drawn from across the United States over the period January 1, 1992, to March 30, 1999, from COMPS.com, a leading provider of commercial real estate sales data. Garmaise and Moskowitz [2003, 2004] provide an extensive description of the COMPS database and detailed summary statistics. There are 14,159 commercial transactions that meet our data requirements over our sample period, where the data span eleven states: California, Nevada, Oregon, Massachusetts, Maryland, Virginia, Texas,

2. While most commercial real estate loans are nonrecourse, our data do not specify the recourse status of individual loans. To the extent that the recourse feature is related to property type and region, our use of property type and census tract fixed effects should account for recourse discrepancies. Furthermore, we verify that all of our main findings are robust to the exclusion of properties with greater than 95 percent leverage, where recourse is more likely to be used. Finally, in California and Oregon pursuing recourse against a defaulting borrower is statutorily prohibited under the preferred and most common form of foreclosure [National Mortgage Servicer's Reference Directory 2001]. All the main results in the paper are robust to using data from only these states.

3. In addition, although very few repeat buyers exist in our sample, including borrower fixed effects to difference out borrower attributes has little effect on the coefficient estimates, but reduces power considerably.

Georgia, New York, Illinois, and Colorado, plus the District of Columbia.

COMPS records for each property transaction the sale price, specific zoning designation (described below), and terms of the loan contract *at the time of sale*. As documented by Garmaise and Moskowitz [2003, 2004], debt financing dominates the financial structure of commercial properties, comprising 71 percent of the property's value on average. These magnitudes suggest that the loans are likely closer to the maximal debt capacity of the asset. COMPS also provides eight digit latitude and longitude coordinates of the property's location, which we link to Census data, survey data from the Wharton Land Use Control Survey, and crime rate data from Cap Index, Inc.

Table I reports summary statistics on the properties in our sample. Panel A shows that the average sale price is \$2.4

TABLE I  
SUMMARY STATISTICS OF ZONING DESIGNATIONS, COMMERCIAL REAL ESTATE  
TRANSACTIONS, AND PROPERTY TYPES

PANEL A: MEAN CHARACTERISTICS OF PROPERTIES ACROSS GENERAL ZONING CATEGORY								
Zoning category	Number	Debt frequency	Leverage	Price	Maturity (duration)	Loan rate	Multiple creditors	Zoning codes
ALL PROPERTIES	14,159	0.71	0.71	2,386,767	15 (6.8)	8.28	0.12	161
Organizations (O)	311	0.63	0.72	3,495,907	10 (7.9)	8.25	0.10	5
Waterfront (W)	6	0.67	0.85	4,887,500	15 (8.6)	7.00	0.25	3
Manufacturing (M)	3,188	0.68	0.72	1,807,378	10 (6.8)	8.73	0.13	25
Residential (R)	7,917	0.81	0.74	1,404,530	25 (10.0)	7.84	0.13	36
Business (B)	1,827	0.67	0.72	3,478,963	7 (6.4)	8.65	0.07	21
Commercial (C)	4,878	0.68	0.67	3,138,222	10 (6.9)	8.64	0.12	53
Comm./Manu. (CM)	252	0.74	0.74	1,003,192	10 (6.6)	8.74	0.19	4
Historic (H)	258	0.68	0.66	3,581,531	10 (7.9)	9.08	0.13	4

PANEL B: DISTRIBUTION OF ZONING CATEGORY ACROSS PROPERTY TYPE								
Property type	General zoning type (abbreviated), number of properties							
	O	W	M	R	B	C	CM	
Retail	94	2	227	247	837	1,898	87	45
Commercial	35	0	107	127	218	749	31	68
Industrial	20	0	1,953	44	78	230	68	25
Apartment	28	0	253	5,860	110	383	12	65
Mobile home park	1	0	1	19	0	2	0	1
Special	10	0	5	176	18	47	3	2
Residential land	38	0	37	1,160	14	57	1	6
Industrial land	5	0	362	16	3	16	4	2
Office	74	4	227	233	520	1,396	38	27
Hotel	6	0	16	35	29	100	8	17

TABLE I  
(CONTINUED)

PANEL C: MEAN CHARACTERISTICS OF PROPERTIES ACROSS PROPERTY TYPE

Property type	Number	Debt frequency	Leverage	Price	Maturity (duration)	Loan rate	Multiple creditors	Cap rate
Retail	3,949	0.74	0.72	1,610,357	10 (6.6)	8.80	0.10	10.33
Commercial	1,650	0.40	0.68	1,670,517	4 (4.9)	8.97	0.07	10.38
Industrial	3,784	0.70	0.73	1,589,490	10 (6.7)	8.72	0.12	9.97
Apartment	6,997	0.90	0.74	1,529,293	25 (10.0)	7.77	0.13	10.04
Mobile home park	41	0.76	0.71	5,087,748	10 (6.8)	8.46	0.19	9.19
Special	290	0.70	0.77	2,109,284	10 (6.2)	8.88	0.20	11.00
Residential land	1,713	0.41	0.75	1,004,216	7 (4.1)	8.91	0.11	N/A
Industrial land	568	0.37	0.74	921,757	8 (4.8)	9.06	0.08	N/A
Office	3,380	0.67	0.68	6,595,045	10 (6.6)	8.60	0.10	10.17
Hotel	270	0.63	0.69	10,574,474	14 (6.6)	8.82	0.22	12.21

Panel A reports the average loan frequency, loan-to-value (LTV) ratio, sale price, median loan maturity and duration (in parentheses) in years, loan rate (percent per year), frequency of multiple lenders (second/subordinated loans), and number of unique zoning code designations for all properties and for each general zoning category. Panel B reports the distribution of general zoning categories across ten property types. The number of properties under each of the eight broad zoning categories for each property type are reported. Panel C reports the average loan frequency, loan-to-value (LTV) ratio, sale price, loan maturity (in years), loan rate (percent per year), frequency of multiple lenders (second/subordinated loans), and capitalization rate (net income on the property in the previous year divided by the sale price, in percent) across the property types. Data are from COMPS.com covering the period January 1, 1992, to March 30, 1999.

million, though values range from \$20,000 to \$750 million. Recorded details of the loan contract include loan-to-value ratio, number of creditors, maturity, interest rate, whether the loan rate is floating or fixed, the length of amortization, and whether the loan was backed by the Small Business Administration (occurring only 1.3 percent of the time). Using the reported interest rate ( $r$ ), loan maturity ( $m$ ), and amortization period ( $a$ ), we estimate the duration  $D$  of the loan assuming that the debt coupons are paid annually and that there is one final balloon payment at maturity:

$$(1) \quad D = \frac{r + 1 - ((m - 1)r + r + 1)(1 + r)^{1-m}}{r(1 - (1 + r)^{-a})} + m \left( \frac{(1 + r)^{1-m} - (1 + r)^{-a}}{1 - (1 + r)^{-a}} \right).$$

The mean age of our properties is just under 29 years, but ranges from zero to 200 years. Overall, the properties in the data set are relatively small and old and are financed with relatively long-term debt compared with institutional quality real estate. (See,

for example, Titman, Tompaidis, and Tsyplakov [2004]).<sup>4</sup> These properties are particularly appropriate for tests of the role of liquidation value since the real option to liquidate the asset (for example, by knocking it down and constructing something new) is more important for older, lower quality buildings.

### *III.B. Zoning Designations*

Our sample consists of properties that are located in a variety of urban and suburban locations: 38.7 percent of the properties are located in the 20 most populated United States cities, 62.3 percent are in the top 50 cities, and 83.8 percent are located in one of these major cities or have a population density of at least 100,000 residents per three-mile radius. We match our sample to the zoning codes of the corresponding urban or suburban locality. We observe 161 unique zoning designations among our properties.

Zoning regulations are controlled by local units of the government and are designed to manage the physical development of land and the uses to which each individual property may be put. Zoning definitions are typically nested and classified along two facets. The first dimension spans the breadth of permitted uses. The most common categories of this dimension in urban areas are business, commercial, manufacturing, residential, organizations, and historic. The second dimension of zoning determines the intensity and scope of the allowable use of the property *within* its broad category. It may limit the permitted size of the building relative to the size of the lot, the number of individual units permitted on the lot, or the maximum height or number of stories. An alphabetic modifier typically describes the zoning category (first dimension), while the second dimension is denoted by a numeric scale. Appendix 1 provides an example of the residential zoning codes in New York City. We term the numerical intensity the “within zoning value.” Higher values indicate broader scopes of allowable uses within the zoning general category.

Since zoning is a local affair, set at the county, city, or municipality level, its ordinances and classifications vary from place to place. Variation in zoning across cities or neighborhoods

4. The length of loan maturity is in part driven by the large fraction of apartment buildings in our sample that carry very long-term loans, perhaps due to the involvement of Fannie Mae and Freddie Mac in this market. Although power is reduced considerably, the magnitudes of our results, including maturity and duration, are robust to the exclusion of apartments.

can be driven by political considerations, esthetic or historic preservation efforts, and motives for controlling growth in an area. Some of these are endogenous and possibly related to an underlying effect that also determines the financing environment. For example, Glaeser and Gyourko [2003] discuss the determination of zoning in an area and its conformity to local market conditions. However, by employing census tract fixed effects, which are much finer than the level at which zoning codes were set or lending markets operate (see Berger, Demsetz, and Strahan [1999], Petersen and Rajan [2002], and Garmaise and Moskowitz [2004, 2005]), we difference out local market conditions potentially affecting the zoning code and financing environment. Variation in zoning within census tracts is a planning tool that provides for a variety of land uses in a given neighborhood, while regulating the effects of externalities. Many zoning designations are quite old and reflect historical planning agendas [McMillen and McDonald 2002]. For example, Swope [2003] reports that as of 2003, zoning laws in many major cities in the United States (e.g., Boston) date back to the 1950s and 1960s, and thus are less likely to be driven by an omitted variable that affects loan provision today. Even in cities in which the zoning ordinance has been amended repeatedly, zoning laws can yield different micro-level zoning designations within a census tract. For example, the Chicago zoning ordinance has been criticized as being unpredictable at the micro level. In the next section we confirm that our within census tract measure exhibits no correlation with local financing characteristics. Table I, Panels A and B, report summary statistics on zoning codes and categories across properties.

### *III.C. Using Zoning Regulations to Measure Liquidation Values*

Using the zoning designation of each property at the time of sale, we exploit variation within an area and zoning category in terms of the flexibility of permitted uses of the property. Our proxy for liquidation value is a measure of the property's redeployability or zoning flexibility *within* its general zoning category. Properties with more flexible zoning designations admit more potential uses. Creditors who seize a property subject to restrictive zoning will find it difficult to pursue alternative uses for the structure or land, whereas creditors who foreclose on a property that is loosely zoned can redeploy the asset in many different ways.

To illustrate the dimensions of zoning and how we compute

our measure of redeployability, consider the case of residential zoning districts in New York City. According to the NYC Zoning handbook, there are eighteen different zoning districts within the residential category. Appendix 1 provides a detailed description of each of the residential zoning districts in NYC and a summary of their permitted uses. The allowable uses within the general residential zoning category are increasing with the zoning district numeric scale. For example, the R-2 zoning district allows for a minimum lot area of 3800 square feet, allows only detached single- or two-family residences, and allows a maximum number of dwelling units per acre of eleven, whereas R-4 allows a minimum lot area of 970 square feet, semidetached structures as well as single- or two-family residences, and allows up to 45 dwelling units per acre. Moving down the code, the higher the numeric value, the fewer constraints placed on property uses.

To construct our redeployability measure, we extract the numeric “within value” to capture redeployability within each broad zoning category. For comparison across locales and zoning categories, we then scale the within zoning numeric value by the numeric value of the zoning designation with maximum allowable uses within its broad category in the local area. For example, a zoning district of M-1 is first coded by a manufacturing dummy variable that is set equal to 1, and a redeployability variable within this category. If the manufacturing zoning designations for a particular locale are M-1, M-2, M-3, and M-4, then the *within* redeployability value is 0.25.<sup>5</sup> Scaling the raw within zoning value for the range of allowable uses in a given area normalizes the local zoning assignments across jurisdictions. For property  $p$  with zoning designation  $A-n$  in jurisdiction  $j$ , this measure is  $n/\max(n \in P_{(A,j)})$ , where  $P_{(A,j)}$  is the set of properties within jurisdiction  $j$  that have the same general zoning category  $A$ . We use the empirically observed maximum value in jurisdiction  $j$  for scale, where results are robust to defining  $j$  to be the zip code, two-mile radius, five-mile radius, county, or MSA. For convenience and uniformity we report results defining locales for scale at the zip code level.

Our measure of redeployability treats each within numeric

5. When modifiers are used in zoning districts, we refine the within numeric values further such that they account for this subdivision. For example, given the following residential zoning designations within an area: R-1, R-2A, R-2B, R-2C, and R-3, the *within* numeric value of R-2C will be 2.67, and its scaled value, which is our measure of redeployability, will equal  $2.67/3.0 = 0.89$ .

value equally for simplicity and to avoid imposing an arbitrary nonlinear structure. We see no reason to expect any bias in the linear specification that would have any relation to loan contract terms. Moreover, we formally test and reject a nonlinear specification in favor of a linear model.<sup>6</sup>

A natural question arises about whether zoning laws are actually enforced and how easy it is to acquire a zoning variance. This issue is essentially an empirical one. The evidence we describe in Section IV in support of the effects of zoning on debt contracts suggests that zoning restrictions certainly do sometimes bind. Rezoning or obtaining a variance is typically difficult and costly (in terms of time, uncertainty, and expense), and therefore zoning remains quite stable. However, we also exploit the variation in zoning enforcement across regions and find that the effects on contracts are magnified in districts where zoning rules are administered more strictly.

Figure I plots the distribution of our redeployability measure across all properties in our sample. The mean (median) scaled flexibility measure is 0.51 (0.50) with a standard deviation of 0.24 and ranges from 0.08 to 1.

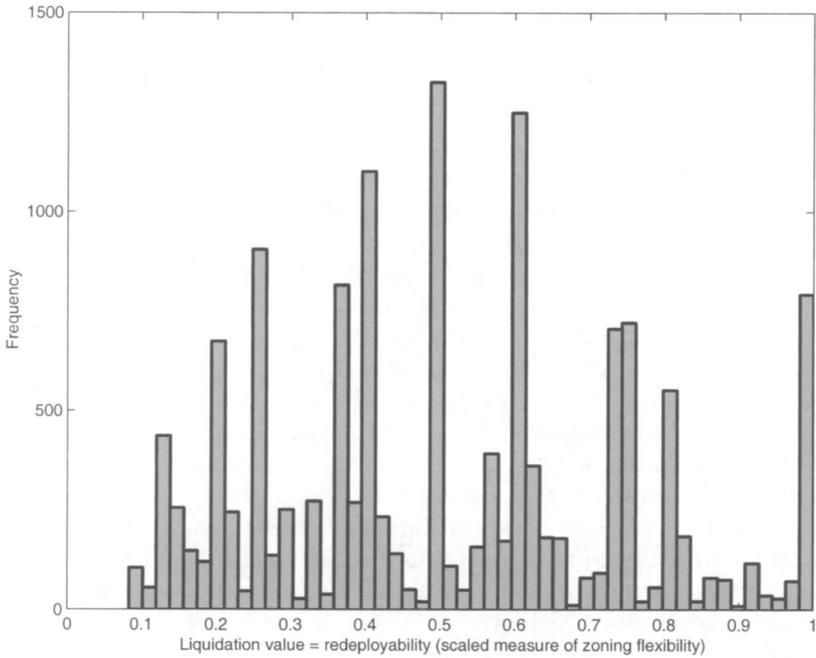
#### IV. EMPIRICAL RESULTS OF REDEPLOYABILITY (THROUGH ZONING)

Using zoning flexibility to measure *ex ante* liquidation value, we test the predictions of the models from Section II.

##### IV.A. *Econometric Model*

Our econometric model considers the effect of our redeployability variables on the following loan characteristics: annual interest rate, frequency (i.e., whether or not a loan is granted, a binary variable), leverage (loan size divided by the sale price), loan maturity in years, loan duration in years, and presence of multiple creditors (a binary variable). The equation estimated is

6. We check for the presence of nonlinearities associated with our redeployability measure by regressing each of our loan characteristics, as well as the sale price, on dummy variables for every redeployability value (there are 427 unique values). We then take the estimated dummy coefficients from this regression, representing the effect each redeployability value has on the particular loan terms or price, and regress them on the continuous redeployability measure, its squared term, and cubed term. For all dependent variables the nonlinear terms are rejected in favor of a linear specification for describing the data.



Summary statistics of the liquidation value measure standard

	Mean	Median	Standard deviation	Minimum	Maximum
Redeployability	0.51	0.50	0.24	0.08	1

FIGURE I

Distribution of Redeployability (Zoning Flexibility)

The distribution of a measure of real asset liquidation value determined by a proxy for the asset's redeployability measured by its zoning classification is plotted, below. The allowable use of the property within its broad zoning category and local zoning jurisdiction, scaled by the maximum allowable uses within an area and zoning category, is the measure of redeployability. Higher values indicate broader scopes of allowable uses within a general category and jurisdiction.

(2) *loan characteristic*<sub>*i*</sub>

$$= F(\text{redeployability}_i, \text{price}_i, \text{cap rate}_i, \text{controls}_i) + \epsilon_i,$$

where *cap rate* is the most recent earnings on the property divided by the sale price, and *controls*<sub>*i*</sub> is a vector of controls containing a set of property and neighborhood attributes for asset *i* including census tract, year, property type, and zoning category

fixed effects, and  $\epsilon_i$  is an error term. The sale price and cap rate are included as regressors to control for value in current use and current profitability, thereby isolating the component of redeployability related to secondary or collateral value. We mainly estimate linear models, though other functional forms are considered for the binary dependent variables.

In advance of our discussion of the empirical results, it is worthwhile to consider the econometric issues raised by our specification in equation (2). The first point is that the sale price itself may be a function of the redeployability variable; we would expect more redeployable properties to realize higher prices and, indeed, we provide evidence in favor of this hypothesis in subsection IV.I. This relation presents no special econometric problem.

The second, and more serious, concern is that some unobservable variable (such as bank redlining) has a simultaneous effect on loan provision, sale prices, and zoning regulations, rendering all of our variables endogenous and difficult to interpret. This issue is taken up in the real estate literature (e.g., McMillen and McDonald [1991], Quigley and Rosenthal [2004], and Wallace [1988]), and there is evidence that local market conditions can affect the general zoning of an area.<sup>7</sup> Therefore, we employ census tract fixed effects to difference out unobservables at a level much finer than the level at which zoning is being set or local financial markets operate. A census tract typically covers between 2500 and 8000 persons or about a four-square block area in most cities, and is designed to be homogeneous with respect to population characteristics, economic status, and living conditions (source: United States Census Bureau). In our loan sample we have 2090 census tracts (about four properties per tract), of which 1296 contain more than one property transaction, 485 have at least five transactions, and 170 contain more than ten transactions.

Local debt market conditions are clearly highly uniform within a census tract, so the financing environment is unlikely to be driving the micro-level zoning variation we study. The standard definition of the local banking market in the literature (e.g., Berger, Demsetz, and Strahan [1999]) is the local Metropolitan Statistical Area (MSA) or non-MSA county. We explicitly test whether zoning and the financing environment within a census

7. Some useful references on the relationship between zoning and prices are Pogodzinski and Sass [1991], Pollakowski and Wachter [1990], Glaeser and Gyourko [2003], and McMillen and McDonald [2002].

tract are related by regressing various lending bank characteristics on our redeployability measure and census tract fixed effects. We find no significant relation between redeployability and average bank deposit size ( $t = -0.74$ ), bank asset size ( $t = -0.61$ ), bank fraction of deposits within the county ( $t = 0.01$ ), city ( $t = -0.01$ ), or zip code ( $t = -1.47$ ), nor the frequency of thrifts ( $t = 0.78$ ). Thus, it is not the case that zoning flexibility within a census tract is correlated with the financial environment.

In addition, we also show that the inclusion of bank fixed effects (with census tract fixed effects) does not materially weaken our results. This result indicates that our findings are not driven by different types of banks making loans to more or less redeployable properties.

We also control for the sale price and earnings-to-price ratio of the property in an attempt to isolate the component of our redeployability measure related to liquidation value. Variables affecting market value and zoning simultaneously should be captured by the sale price and cap rate and may, in fact, understate the effect of our zoning variable on loan terms. Potential omitted variables affecting zoning and financing on a specific property within a census tract, type, year, and zoning category *and* controlling for sale price and cap rate, are difficult to envision. Moreover, previous empirical work shows that higher “quality” areas are associated with restrictive zoning [Quigley and Rosenthal 2004], while we find, by contrast, that it is flexible zoning that predicts greater loan provision. Thus, it is difficult to argue that “quality” effects are driving our results.

Alternatively, unobservable variables may be property-specific, for example a characteristic of the buyer. It is highly unlikely, however, given the stability of zoning classifications, that any buyer characteristic could affect the zoning of a property *at the time of sale*. Moreover, because census tracts are designed to capture population and economic homogeneity, using tract fixed effects helps control for characteristics of buyers and sellers. In addition, despite having only a few multiple borrowers, and therefore very low power, we find that our results are robust to the inclusion of borrower fixed effects in the sense that our point estimates are similar. Borrower fixed effects effectively difference out any quality differences across borrowers.

We are essentially estimating reduced-form equations for the price, quantity, and terms of the debt supplied, which is reasonable since we are only interested in testing the equilibrium out-

comes and implications proposed by the theories in Section II. As argued earlier, these effects may be closer to supply-side constraints. The similarity of the coefficients under the borrower fixed effects specification also indicate that we are likely capturing supply-side effects. However, while it would be interesting to differentiate among the theories, our data are insufficiently rich for us to do so. Therefore, we can only say whether the results are consistent with these theories in general.

#### *IV.B. Asset Redeployability (Flexibility of Zoning)*

The first column of Table II Panel A reports results for the regression of the loan interest rate on our redeployability measure, the log of the sale price and the capitalization rate of the property, and a set of controls including census tract fixed effects. In addition to fixed effects for year, property type, census tract, and zoning category, we include the Herfindahl index of banking concentration within a fifteen-mile radius of the property (a measure of local bank competition for commercial loans), the log of property age, and the 1995 crime risk and growth in crime risk from 1990 to 1995.<sup>8</sup> In addition, we also include attributes of the loan such as maturity, amortization, leverage, and dummies for floating rate loans and Small-Business-Administration-backed loans.

We find that redeployability significantly decreases the interest rate charged, controlling for the debt level. Moving from the least flexibly zoned designation to the average (most) flexibly zoned within an area and zoning category translates into a 27 (58) basis point drop in loan interest rates. This result is consistent with Prediction 2.<sup>9</sup>

The second and third columns of Table II, Panel A, examine the relation between leverage and redeployability. Column 2 employs a binary dependent variable for whether debt is used. We estimate a linear probability model to avoid making functional form assumptions, but a conditional logit model yields similar results. We find that properties with greater redeployability do

8. Crime risk data come from CAP Index, Inc., who compute the crime score index for a particular location by combining geographic, economic, and population data with local police, FBI Uniform Crime Reports, victim, and loss reports. See Garmaise and Moskowitz [2005] for further discussion.

9. Harris and Raviv [1990] claim that when not conditioning on loan size, the promised yield should increase with liquidation value. This numerical result of their model is not borne out by the data, however, as unconditional interest rates are also decreasing in redeployability in unreported results.

TABLE II  
ASSET REDEPLOYABILITY (MEASURED BY ZONING INTENSITY OF USE)  
AND DEBT CONTRACTS

PANEL A: CENSUS TRACT FIXED EFFECTS						
Dependent variable =	Interest rate	Debt frequency	Leverage	Debt maturity	Loan duration	Multiple creditors
Redeployability	-0.6311 (-2.59)	0.0078 (0.13)	0.0447 (2.12)	2.4821 (1.94)	0.4892 (2.50)	-0.0926 (-2.36)
log(price)	-0.0850 (-3.85)	-0.0235 (-4.67)		-0.7173 (-5.94)	-0.0678 (-3.65)	0.0091 (2.61)
Cap rate	0.0081 (1.98)	0.0077 (8.01)	0.0042 (2.60)	0.2292 (10.11)	0.0393 (11.24)	-0.0027 (-4.16)
<i>Fixed effects?</i>						
Census tract	yes	yes	yes	yes	yes	yes
General zoning	yes	yes	yes	yes	yes	yes
Property type	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
$R^2$	0.64	0.35	0.34	0.51	0.46	0.27
$R^2$ (no F.E.)	0.26	0.08	0.06	0.16	0.10	0.04
# Observations	3,536	9,365	7,733	7,733	1,971	7,733
PANEL B: CENSUS TRACT AND BANK FIXED EFFECTS						
Dependent variable =	Interest rate	Debt frequency	Leverage	Debt maturity	Loan duration	Multiple creditors
Redeployability	-0.8121 (-4.08)	0.0271 (0.59)	0.0477 (2.31)	2.0535 (1.21)	0.6679 (2.82)	-0.0964 (-2.04)
log(price)	-0.0963 (-3.86)	-0.0321 (-7.04)		-0.4951 (-2.81)	-0.0489 (-1.90)	0.0320 (4.41)
Cap rate	0.0280 (5.85)	0.0051 (5.99)	0.0024 (1.57)	0.1111 (3.60)	0.0327 (7.62)	-0.0002 (-0.15)
<i>Fixed effects?</i>						
Bank	yes	yes	yes	yes	yes	yes
Census tract	yes	yes	yes	yes	yes	yes
General zoning	yes	yes	yes	yes	yes	yes
Property type	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
$R^2$	0.86	0.42	0.59	0.67	0.73	0.86

Panel A reports regression results of the loan interest rate, frequency of debt, total leverage, debt maturity, loan duration, and the frequency of multiple creditors on a measure of real asset redeployability, using the allowable use of the property given by its zoning classification. Additional regressors include the log of the sale price of the property (excluded from the loan-to-value regression), the capitalization rate of the property (the current earnings on the property divided by the sale price), the Herfindahl index of banking concentration within a fifteen-mile radius of the property, the log of property age, and the current crime risk level and recent growth rate in crime risk for the property's location (obtained from CAP Index, Inc.). The interest rate regressions also include the leverage ratio, an indicator for floating rates, an indicator for whether the loan is backed by the Small Business Administration, and the loan maturity and amortization as regressors. Regressions include fixed effects for general zoning category, property type, year, and census tract. Regressions are run under OLS with robust standard errors. Coefficient estimates and their associated  $t$ -statistics (in parentheses) are reported along with adjusted  $R^2$ s, including and excluding the fixed effects, and the number of observations. Panel B adds bank fixed effects to the regressions.

not receive loans significantly more frequently. However, debt frequency is apparently the only loan characteristic that is not affected by a property's redeployability. As column 3 indicates, leverage, or the size of the loan as a fraction of the sale price, conditional on a loan being present, increases with redeployability. Moving from the least to average (maximum) zoning flexibility results in a 1.9 (4.1) percentage point increase in leverage.<sup>10</sup> This result provides support for Prediction 1: assets with greater liquidation values have higher debt levels. If, as argued earlier, debt levels are more likely driven by supply-side constraints, then this result indicates higher debt capacity with liquidation values as well.

Column 4 of Panel A details results in support of Prediction 3 that loan maturities significantly increase with liquidation values. A move from the least to the average (most) flexible zoning designation within a neighborhood and zoning category results in approximately 1.1 (2.3) more years of maturity on the loan. Given that the mean loan maturity in the sample is roughly fifteen years, this is a 7.3 (15.3) percent increase. Column 5 also shows that loan duration increases with redeployability. A move from the least to the average (most) redeployable property leads to an increase in duration of approximately 0.2 (0.5) years. This result provides further support for Prediction 3.

Finally, Prediction 4 states that firms will borrow from one creditor when liquidation value is high and from multiple creditors when liquidation value is low. To test this prediction, we regress the presence of a second creditor on our redeployability measure. Column 6 of Table II Panel A shows that assets with higher redeployability are significantly less likely to be financed by multiple creditors, supporting this prediction. The difference between the least and average (most) redeployable assets translates into a 4.0 (8.5) percentage point decline in the probability of multiple creditors being present, which is a 33 (71) percent decline from the 12 percent frequency of multiple creditors in the sample.

In terms of the dollar benefit from these loan terms, for the average (median) property sale price of \$2.4 (\$0.6) million and average (median) leverage ratio of 0.71 (0.82), the maximum interest rate savings from more redeployable assets is \$10,700

10. We report OLS results. The truncated regression models of Cragg [1971] and Powell [1986] yield similar findings.

(\$3,100) per year. Over the fifteen-year average length of the loan, the present value of these savings is \$90,041 (\$27,000 at the median) assuming a discount rate equal to the average loan rate (8.28 percent). Taking into account that more redeployable assets have greater leverage (+4.5 percent) and longer maturity (+2.5 years), the present value of savings increases to \$104,360 or \$11,353 per year on average and \$31,308 or \$3,406 per year at the median. These are the maximum effects from redeployability moving from the least to most flexibly zoned in an area. Moving from least to average flexibility results in values of about half those above.

#### *IV.C. Bank Fixed Effects*

In Table II, Panel B, we repeat the regressions in Panel A adding bank fixed effects. We analyze how the loan terms offered by a given bank in a census tract vary with the redeployability of a property. Bank fixed effects eliminate any bank-specific lending policies or specialization that might be related to zoning, providing another control for the financing environment. As Panel B shows, the point estimates are remarkably similar to those in Panel A and, despite losing power, the results remain statistically significant (except for debt maturity). This result suggests that our findings do not arise from the matching of redeployable properties with certain types of banks.

#### *IV.D. Robustness*

An alternative hypothesis for our results is that lenders simply base their decisions on the current price or earnings of the property, having nothing to do with collateral or secondary value. If zoning is related to the value of the property and its future earnings, and the log of the sale price and cap rate (current earnings over price) do not fully capture these effects, then our results may have nothing to do with collateral value, which is the basis of the theories we propose to test. This alternative story seems particularly relevant for interest rates and leverage, but it is more difficult to see why maturity and multiple creditors would be affected if collateral were unimportant. Nevertheless, we attempt to address this alternative hypothesis directly. First, we test the robustness of our findings to alternative specifications that control for sale price and earnings-to-price by including interactions of the cap rate and

sale price with zoning category and property type dummies, as well as adding squared and cubed terms of  $\log(\text{sale price})$  and cap rate to the regression. In all these specifications, the coefficients on redeployability are virtually unchanged (statistically and economically) across the loan characteristics (results not reported), having little impact on the effect of our zoning redeployability measure.

#### *IV.E. Ease of Foreclosure*

A more direct test of whether more flexible zoning captures liquidation value or is correlated with property attributes having little to do with liquidation value, is to consider the impact of our redeployability measure when the probability of liquidation is *ex ante* higher or lower. If our measure is unrelated to liquidation value, then the likelihood of the liquidation state should have little impact on the effect of zoning on loan terms.

To analyze this question, we consider state-level variation in the ease of foreclosure. There is substantial variation across states in the time and cost required to seize a property from a defaulted debtor [Pence 2003]. If, as we argue, redeployability affects the value of a property in the hands of a creditor, then it should be much less important in states in which foreclosure is very slow and costly, since the discounted value of seizing a property in such states is low, irrespective of its potential future uses (redeployability). However, if the alternative theory holds, that collateral is unimportant or our measure fails to capture it, then redeployability would not be more important in states in which foreclosure is easy, since foreclosure affects only the bank's access to the collateral. Indeed, under the alternative hypothesis one might argue that expected future operating cash flows are more important for loan terms in hard-to-foreclose jurisdictions, since the creditor really wants to avoid default in those states. This alternative would imply our measure having a larger rather than smaller effect on loan terms in hard-to-foreclose states.

To measure the cost of foreclosure, we make use of data on Fannie Mae's optimum time frame within which it expects a foreclosure to be completed in various states. This time frame is highly correlated with other estimates of the average length of time required to accomplish a foreclosure [National Mort-

gage Servicer's Reference Directory 2001]. We construct a measure of foreclosure times that takes the value of three for time frames more than 200 days, two for time frames between 120 and 200 days, one for time frames between 60 and 120 days, and zero otherwise. We also consider whether the state allows nonjudicial foreclosures, which are substantially less costly than judicial foreclosures [Pence 2003]. Our measure for the cost of foreclosure is the sum of a dummy for judicial foreclosures and the foreclosure time variable above, described in Appendix 2 for reference.

In Table III Panel A, we report results from regressing loan terms on redeployability, the interaction between redeployability and cost of foreclosure, and the controls from the previous regressions. (Note that census tract fixed effects account for the level of the state-level foreclosure variable, but not its interaction.) The results indicate that differences in redeployability across properties are less important for loan terms where the costs of foreclosure are high. Specifically, the interaction between redeployability and foreclosure costs is significantly positive for interest rates and multiple creditors and significantly negative for debt maturity and loan duration. These results suggest redeployability proxies for the value of collateral rather than unobserved future earnings or property quality.

#### *IV.F. Zoning Strictness*

In Panel B of Table III we further examine whether the impact of zoning regulations differs across jurisdictions. In particular, we expect that zoning regulations should matter more in areas with stricter application of zoning rules. To test this prediction, we interact our redeployability measure with variables designed to capture strictness of zoning regulation.

We capture the strictness of zoning using two measures from the Wharton Land Use Control Survey (see Glaeser and Gyourko [2003]). The first variable is an index of zoning strictness for an area, created by taking the average of the percentage of applications for zoning changes that were approved in the local MSA during 1989 (coded as follows 5 = 0 to 10 percent, 4 = 11 to 29 percent, 3 = 30 to 59 percent, 2 = 60 to 89 percent, 1 = 90 to 100 percent) and the estimated number of months between application for rezoning and issuance of a building permit for the development of a property in the MSA,

TABLE III  
CROSS-SECTIONAL EVIDENCE ON REDEPLOYABILITY AFFECTING DEBT CONTRACTS

Dependent variable =	Interest rate	Debt frequency	Leverage	Debt maturity	Loan duration	Multiple creditors
PANEL A: INTERACTIONS WITH FORECLOSURE COSTS						
Redeployability	-1.4389 (-4.11)	-0.0083 (-0.10)	0.0362 (1.24)	4.8318 (2.61)	0.6259 (2.23)	-0.1082 (-2.74)
Redeployability × foreclosure cost	0.8076 (3.22)	0.0146 (0.30)	0.0080 (0.42)	-1.9448 (-1.75)	-0.1099 (-1.68)	0.6226 (2.88)
PANEL B: INTERACTIONS WITH STRICTNESS OF ZONING						
Redeployability	1.0669 (1.94)	-0.6668 (-2.66)	-0.4448 (-4.82)	-7.5846 (-1.14)	-2.6489 (-2.85)	0.3330 (2.01)
Redeployability × zoning strictness	-2.8903 (-2.39)	0.3669 (3.08)	0.2270 (5.39)	4.7521 (1.59)	1.6350 (3.75)	-0.1862 (-2.39)
Redeployability	1.1971 (0.57)	-0.2924 (-0.65)	-0.1370 (-0.82)	-15.4856 (-1.47)	-3.3267 (-2.13)	-0.2724 (-1.03)
Redeployability × growth management	-0.4061 (-1.89)	0.0797 (1.81)	0.0369 (2.02)	4.0564 (1.74)	0.9022 (2.60)	0.0512 (0.87)
PANEL C: INTERACTIONS WITH LOCAL MARKET LIQUIDITY						
Redeployability	0.2670 (0.91)	-0.3969 (-2.49)	-0.3000 (-4.74)	-8.5374 (-1.95)	-1.8720 (-3.09)	0.1501 (1.37)
Redeployability × demand-to-supply	-1.2878 (-1.64)	0.2108 (3.34)	0.1364 (5.79)	4.4819 (2.79)	1.1029 (4.73)	-0.0843 (-2.01)

Regression results of the loan interest rate, frequency of debt, total leverage, debt maturity, loan duration, and frequency of multiple creditors on asset redeployability (measured by the intensity of allowable use from the property's zoning designation) and its interaction with characteristics of the local market in which the property resides are reported. Panel A considers the interaction with ease of foreclosure at the state level. This variable is the sum of a judicial-foreclosure-only dummy and an index for the 1998 Fannie Mae optimum foreclosure time frame. Panel B examines interactions with variables designed to capture the strictness of zoning. The first is an index of zoning strictness which is the average of the following two measures from the Wharton Land Use Control Survey: the percentage of applications for zoning changes that were approved in the local MSA during 1989, and the estimated number of months between application for rezoning and issuance of a building permit for the development of a property in the MSA (average for single family units and office buildings). The second measure is an index of the effectiveness of growth management techniques employed in the MSA obtained from the Wharton Land Use Control Survey. Specifically, survey respondents' assessment of the effectiveness of ordinances, building permits, and zoning ordinances in controlling growth are provided on a scale of 1 (not important) to 5 (very important) and the average across the three categories is the growth management index. Panel C examines the interaction of redeployability with a measure of local market liquidity, namely, the average of the quantitative ratings of survey respondents from the Wharton Land Use Control Survey on the ratio of demand for land uses relative to the acreage of land zoned for those uses across single family, multifamily, commercial, and industrial uses, and across various lot sizes. All regressions include the regressors from Table II Panel A, including census tract, general zoning category, property type, and year fixed effects with robust standard errors. Appendix 2 details the sources and computations of all relevant variables.

taking the average for single family units and office buildings (coded as follows 1 = Less than 3 months, 2 = 3 to 6 months, 3 = 7 to 12 months, 4 = 13 to 24 months, 5 = More than 24 months). Interacting the zoning strictness index with redeploy-

ability and rerunning the loan term regressions (including census tract fixed effects),<sup>11</sup> Table III Panel B shows that property-specific redeployability has a stronger effect on loan characteristics in jurisdictions with strict zoning rules. In regions with the lowest level of zoning strictness, redeployability does not have statistically or economically significant effects.

The second zoning rigor measure we use is an index of the effectiveness of growth management techniques employed in the MSA through zoning ordinances and permits. Specifically, survey respondents' assessment of the effectiveness of ordinances, building permits, and zoning ordinances in controlling growth are provided on a scale of 1 (not important) to 5 (very important) and the average across the three categories is the growth management index we employ. As Panel B shows, redeployability has a greater effect on all loan characteristics in jurisdictions that use zoning ordinances and permits most effectively to control and manage growth in the area. The two sets of results in Panel B indicate that zoning flexibility is a better measure of redeployability in areas where zoning matters more and is adhered to more tightly. Appendix 2 describes in more detail the construction of these variables and their source.

#### *IV.G. Market Liquidity*

Panel C of Table III examines interactions with measures of local market liquidity. The measure we employ is the average of the qualitative ratings by the Wharton Land Use Control Survey respondents comparing the acreage of land zoned versus demanded across single family, multifamily, commercial, and industrial uses, and across various lot sizes (coded on a 1–5 rating scale: 1 = Far more than demanded, 5 = Far less than demanded). Appendix 2 details the construction of this measure. When demand for a type of property is high relative to supply, we expect the redeployment option to be of greater use and to be exploited more frequently. If, by contrast, land is plentifully available, then there should be little incentive to redeploy a property. The results displayed in Panel C show that redeployability has the predicted stronger effect on all loan characteristics

11. Since this variable is measured at a level greater than a census tract (MSA), including census tract fixed effects accounts for the level of this variable.

TABLE IV  
HISTORIC ZONING DESIGNATIONS

Dependent variable =	Interest rate	Debt frequency	Leverage	Debt maturity	Loan duration	Multiple creditors
Historic	0.5913 (3.17)	-0.1085 (-2.27)	-0.0490 (-2.17)	-0.4942 (-0.39)	-0.1109 (-1.93)	0.1187 (2.49)
Redeployability	0.8540 (1.88)	-0.1205 (-1.31)	-0.0996 (-0.80)	-3.6482 (-0.83)	0.6445 (1.69)	0.2027 (1.56)
Redeployability × historic	-1.9869 (-3.84)	0.2219 (2.03)	0.3050 (2.26)	11.2079 (2.17)	0.3075 (0.59)	-0.3126 (-2.02)

Regression results of the loan interest rate, frequency of debt, total leverage, debt maturity, loan duration, and frequency of multiple creditors on an indicator variable for properties with a historic zoning designation are reported. Results from interacting the redeployability measure with the historic dummy are also reported. The regressions include the control variables from Table II, Panel A, including fixed effects for census tract, general zoning category, property type, and year with robust standard errors. Coefficient estimates and their associated *t*-statistics (in parentheses) are reported.

(though it is insignificant for duration) when relative demand is strong.

#### IV.H. Historic Zoning

Historic zoning regulations tend to be especially conservative, inflexible, and well-enforced, so a historic designation can substantially reduce a property's redeployability and liquidity. As another measure of liquidation value, we therefore examine a historic zoning designation's effect on loan contracts in Table IV. We include the usual controls and census tract fixed effects. We find that properties zoned historic receive significantly fewer, smaller and shorter duration loans, are financed at higher interest rates, and are more likely to be financed by multiple creditors. The economic magnitudes of these effects are large. A historic designation is associated with an interest rate that is 59 basis points higher, a 10.8 percentage point reduction in the probability of a loan, a 4.9 percentage point smaller loan-to-value ratio, a loan duration that is 0.11 years shorter, and an 11.9 percentage point increase in the probability of multiple creditors. The effect on debt maturity is statistically insignificant.

Moreover, it is also generally quite difficult to change zoning classifications for historically zoned properties. Therefore, the current zoning designation should be more binding for historic properties and should enhance the impact of our

zoning redeployability measure. Consistent with this prediction, the interaction term between redeployability and historic designation provides even greater effects on all loan terms (other than duration, which has the right sign but is insignificant) in Table IV.

#### *IV.I. Liquidation Value and Current Market Price*

Finally, although the primary focus of our analysis is on the features of the debt contract, we also analyze the relation between redeployability and prices. We recognize that this regression is more open to endogeneity concerns, and we interpret the result with caution. Nevertheless, this analysis provides a test of Prediction 5 that an asset's market price increases with liquidation value.

We regress the log of the property sale price on our redeployability measure and current earnings as a measure of property size and profitability, and include the census tract and other fixed effects. The coefficient on redeployability is positive, 0.75, and statistically significant ( $t = 8.92$ ), indicating that higher liquidation value is associated with higher market price, though we note that the direction of causality is not indisputable.<sup>12</sup>

### V. CONCLUSION

Despite the breadth of theory on incomplete contracting for financial structure, supporting evidence is sparse. The lack of empirical evidence is in part due to the difficulty in obtaining *ex ante* measures of asset liquidation value and observing asset-specific contracts. We provide novel evidence linking asset liquidation value, measured through regulation of zoning flexibility, and debt structure using asset-specific commercial loan contracts. Greater asset redeployability and higher liqui-

12. Interestingly, this result contrasts with the general finding in the residential real estate market that tighter zoning is associated with higher prices [Quigley and Rosenthal 2004]. This discrepancy may arise largely from between-versus within-neighborhood comparisons. Our result that zoning flexibility increases property values is property-specific, relative to properties within a census tract, whereas Quigley and Rosenthal's results are between neighborhoods. It may well be that zoning flexibility is valuable for each property owner, but that the negative externalities of zoning flexibility reduce property values at the neighborhood level.

dation values significantly alter the terms of loan contracts in a manner consistent with theories of incomplete contracting and transaction costs. More redeployable assets are financed at lower interest rates, receive larger, longer maturity, and longer duration loans, and are less likely to face multiple creditors. Extending these results to nondebt contracts and loans without the nonrecourse feature may shed more light on the importance of contractual incompleteness and transaction costs in determining the boundaries of the firm.

In addition to incomplete contracting theories of capital structure, our results also emphasize the importance of collateral in financial contracting and credit market rationing. While most of the literature analyzes collateral requirements rather than collateral quality (e.g., Stiglitz and Weiss [1981] and Wette [1983]), the effect of collateral quality on credit rationing is a potentially important question that has not received detailed empirical study. For instance, we show that higher liquidation values and interest rates are negatively correlated (predicted by Bester [1985]), yet we also find that higher liquidation values imply larger loans. Thus, better collateral decreases the amount of credit rationing as well as the cost of borrowing.

#### APPENDIX 1: AN EXAMPLE OF THE ZONING CODE FROM NYC ZONING OF RESIDENTIAL DISTRICTS

This appendix presents a detailed description of each of the residential zoning districts in New York City as an example of the variation in zoning laws employed to capture liquidation values across real assets. A summary of the zoning code and the associated permitted uses of the property as defined by the code are reported for residential districts in NYC only. Similar measures are applied for the districts within the other eight broad zoning categories: organizations, waterfront, manufacturing, business, commercial, commercial/manufacturing, historic, and residential and across all other zoning districts and cities in our sample from 1992 to 1999 covering twelve states (including the District of Columbia) and roughly 850 different zip codes.

Zoning designation	Uses	Maximum floor area ratio	Minimum required open space ratio	Maximum lot coverage	Minimum required lot area (sq. ft.)		Maximum number of dwelling units or rooms per acre
					Per dwelling unit	Per zoning room	
R1-1	Single-family detached residence	0.50	150	—	9500	—	4
R1-2	Single-family detached residence	0.50	150	—	5700	—	7
R2	Single-family detached residence	0.50	150	—	3800	—	11
R2X	Single-family detached residence	0.50	150	—	3800	—	11
R3-1	Single, two-family detached, semidetached residence	0.50	—	35	1040/1450	—	30/42
R3-2	General residence	0.50	—	35	1040/1450	—	30/42
R3A	Single, two-family detached, zero lot line residence	0.50	—	35	1040/1450	—	30/42
R4	General residence	0.75	—	45	970	—	45
R4-1	Single, two-family detached, semidetached, zero line residence	0.75	—	45	686-970	—	45/65
R4A	Single, two-family detached residence	0.75	—	45	686/970	—	45/65
R4B	Single, two-family detached residences of all types	0.75	—	45	686/970	—	45/65
R5	General residence	1.25	—	55	605	—	72
R5B	General residence	1.65	—	55	545/605	—	80
R6	General residence	0.78-2.43	27.5 to 39.5	—	—	109 to 99	160/176 400/460
R7	General residence	0.87-3.44	15.5 to 22.0	—	—	84 to 77	207/226 519/566
R8	General residence	0.94-6.02	5.9 to 10.7	—	—	59 to 45	295/387 738/968
R9	General residence	0.99-7.52	1.0 to 6.2	—	—	45 to 41	387/425 968/1062
R10	General residence	10	None	—	—	30	581 1452

Source: NYC Zoning Handbook.

A detailed description of each of the residential zoning districts in New York City as an example of the variation in zoning laws employed to capture liquidation values across real assets. A summary of the zoning code and the associated permitted uses of the property as defined by the code are reported for residential districts in NYC only. Similar measures are applied for the districts within the other eight broad zoning categories: organizations, waterfront, manufacturing, business, commercial, commercial/manufacturing, historic, and residential and across all other zoning districts and cities in our sample.

## APPENDIX 2: VARIABLE DESCRIPTION AND CONSTRUCTION

For reference, a list of the construction of the variables used in the paper and their sources is presented.

*Redeployability* (flexibility of use): the scaled within zoning category and jurisdiction numeric value associated with a given property's zoning ordinance. For property  $p$  with zoning ordinance  $A-n$  in jurisdiction  $j$ , this measure is  $n/\max(n \in P_{(A,j)})$ , where  $P_{(A,j)}$  is the set of properties within jurisdiction  $j$  that have the same general zoning category  $A$ . Redeployability is the numeric value indicating flexibility of use  $n$  relative to the maximum flexibility within a given property type  $A$  and local jurisdiction  $j$  which sets the zoning code. (source: COMPS)

*Zoning category*: dummy variables for the broad zoning designation of a property. For property  $p$  with zoning designation  $A-n$ , this is  $A$ . There are eight broad zoning categories in the sample: organizations, waterfront, manufacturing, residential, business, commercial, commercial-manufacturing, and historic. (source: COMPS)

*Debt frequency*: a binary variable for whether the property was financed with bank debt (occurring 71 percent of the time). (source: COMPS)

*Leverage*: the ratio of total value of bank debt borrowed on the property to the sale price. (source: COMPS)

*Debt maturity*: the maturity of the bank loan contract in years. (source: COMPS)

*Loan interest rate*: the annual percentage interest rate on the bank loan contract and whether it is floating or fixed. (source: COMPS)

*Multiple creditors*: a binary variable for the presence of more than one creditor making a loan on the property. Commercial properties have first and second trust deeds (mortgages), where the latter has lower priority claim on the real asset. These occur about 12 percent of the time and indicate the presence of more than one creditor. (source: COMPS)

*Capitalization rate*: the current or most recent annual earnings on the property divided by the sale price. (source: COMPS)

*Property type*: dummy variables indicating ten mutually exclusive types: retail, commercial, industrial, apartment, mobile home park, special, residential land, industrial land, office, and hotel. (source: COMPS)

*Crime risk:* A crime score index comprising the seven part one offenses of the FBI: homicide, rape, aggravated assault, robbery, burglary, larceny, and motor vehicle theft. The crime risks measure the probability that a certain crime will be committed in a given location relative to the county level of crime. Hence, this variable is a *relative* (within county) crime risk measure. Crime scores are provided at three points in time: 1990, 1995, and 2000. Each property is matched with the crime score index for its latitude and longitude coordinates, obtaining a *property specific* crime score. Both the level of crime risk (relative to the county level) and the growth in crime risk (change in relative crime risk from 1990 to 1995) are employed as control variables. (source: CAP Index, Inc.)

*Zoning strictness index:* the average of the following two measures from the Wharton Land Use Control Survey (WLUCS), Wharton Urban Decentralization Project: the percentage of applications for zoning changes that were approved in the local MSA during 1989, and the estimated number of months between application for rezoning and issuance of a building permit for the development of a property in the MSA. The first variable is ZONAPPR from the WLUCS—the estimated percentage of applications for zoning changes approved during the past twelve-month period in the MSA coded from 1–5 as follows: [1 = 0 to 10 percent, 2 = 11 to 29 percent, 3 = 30 to 59 percent, 4 = 60 to 89 percent, 5 = 90–100 percent]. The second variable is the average of the following three variables.

1. PERMLT50—the estimated number of months between application for rezoning and issuance of building permit for the development of a subdivision of less than 50 single family units coded as follows: [1 = Less than 3 months, 2 = 3 to 6 months, 3 = 7 to 12 months, 4 = 13 to 24 months, 5 = More than 24 months, 6 = N/A].
2. PERMGT50—the estimated number of months between application for rezoning and issuance of building permit for the development of a subdivision of more than 50 single family units coded as follows: [1 = less than 3 months, 2 = 3 to 6 months, 3 = 7 to 12 months, 4 = 13 to 24 months, 5 = more than 24 months, 6 = N/A].
3. PERMOFF—the estimated number of months between

application for rezoning and issuance of building permit for the development of an office building of under 100,000 square feet coded as follows: [1 = less than 3 months, 2 = 3 to 6 months, 3 = 7 to 12 months, 4 = 13 to 24 months, 5 = more than 24 months, 6 = N/A].

The zoning strictness index is computed as  $(5 - ZONAPPR) + (PERMLT50 + PERMGT50 + PERMOFF)/3$ , excluding MSA's with 6 = N/A. (source: Wharton Land Use Control Survey, Wharton Urban Decentralization Project, Development Regulation Survey Questionnaire, 1989. Also see Glaeser and Gyourko [2003]).

*Growth management index:* The effectiveness of growth management techniques through ordinances, zoning ordinances, and permits employed in the MSA obtained from the Wharton Land Use Control Survey. The average of the variables GROMAN2, GROMAN3, and GROMAN8 are employed as the growth management index. GROMAN2, 3, and 8 are quantitative ratings by survey respondents of the effectiveness of growth management techniques in controlling growth in their community using ordinances, building permits, and zoning ordinances, respectively. The rating is on a scale of 1–5 and is coded as follows: [1 = Not important, 5 = Very important]. (source: Wharton Land Use Control Survey, Wharton Urban Decentralization Project, Development Regulation Survey Questionnaire, 1989. Also see Glaeser and Gyourko [2003]).

*Demand-to-supply:* the average of the quantitative ratings of survey respondents from the Wharton Land Use Control Survey on the ratio of demand for land uses relative to the acreage of land zoned for those uses across single family, multifamily, commercial, and industrial uses, and across various lot sizes. Specifically, the measure of demand to supply is the average of the following variables:

1. DLANDUS1–4—quantitative rating by survey respondent comparing the acreage of land zoned versus demand for the following land uses: Single family, Multifamily, Commercial, and Industrial. [1–5 rating scale: 1 = Far more than demanded, 5 = Far less than demanded, 0 = No opinion or No reply].
2. DLOTSIZ1–5—quantitative rating by survey respondent comparing the availability of land zoned versus demand for the following single family residential lot sizes: Less

than 4,000 square feet, 4,000 to 8,000 square feet, 8,000–10,000 square feet, 10,000–20,000 square feet, and More than 20,000 square feet. [1–5 rating scale: 1 = Far more than demanded, 5 = Far less than demanded, 0 = No opinion or No reply].

We exclude zeros or no replies. (source: Wharton Land Use Control Survey, Wharton Urban Decentralization Project, Development Regulation Survey Questionnaire, 1989. Also see Glaeser and Gyourko [2003]).

*Foreclosure costs*: the sum of two variables, time frame for foreclosure and judicial foreclosure dummy. The time frame for foreclosure is based on the 1998 Fannie Mae optimum time within which it expects a foreclosure to be completed in a given state. The time frame variable takes the value of three for time frames more than 200 days, two for time frames between 120 and 200 days, one for time frames between 60 and 120 days, and zero otherwise. The judicial foreclosure variable is zero if the state permits nonjudicial foreclosures and one otherwise. (source: National Mortgage Servicer's Reference Directory [2001]).

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