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Asset-Backed Securities: Costs and Benefits of "Bankruptcy Remoteness"*

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Abstract

This paper focuses on a key property of asset-backed securities (ABS); namely, that ABS are designed to achieve "bankruptcy remoteness" of the securitized assets from the borrowing firm. This provides lenders with maximal protection from dilution that is not available with other contracts, such as secured debt. ABS can have real effects in allowing firms to commit to more efficient investment decisions in bankruptcy. We show that securitization of *replaceable* assets (such as receivables) prevents inefficient continuation in bankruptcy, but securitization of *necessary assets* can lead to inefficient liquidations. In these circumstances, secured debt and/or leases can be preferred.

Our model also predicts that greater legal risk of "bankruptcy remoteness" being undermined by courts leads to lower overall efficiency and higher interest rates for ABS investors. We test this second prediction using a controversial decision in the Chapter 11 bankruptcy of LTV Steel, in which a securitization contract was unexpectedly treated as a secured loan. Using a difference-in-differences approach, we find that ABS spreads for securitizers eligible for Chapter 11 increased significantly more than spreads for insured bank securitizers, who are not Chapter 11-eligible, in the period following the LTV filing. The results demonstrate that the creditor protection provided by "bankruptcy remoteness" is indeed valuable and priced in financial markets.

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1 Introduction

Theories of debt finance, ranging from the costly state verification literature (Townsend (1979), Gale and Hellwig (1985)) to the literature of incomplete financial contracts (Bolton and Scharfstein (1990, 1996), Hart and Moore (1994)) focus on the disciplinary role of debt in financial contracting. The distinguishing feature of debt in these models is the collection rights given to the lender following a default by the borrowing firm. In essence, these models assume that, once the borrower defaults, the lender can take possession of whatever assets remain in the firm and dispose of them as the lender pleases. Bankruptcy law is often referenced as the mechanism by which this transfer of control rights takes place.

While these theories capture the main feature that distinguishes debt from equity, they are less able to distinguish between several "debt-like" financial contracts, all of which give packages of priority and control rights to lenders, but vary in the strength of these rights in bankruptcy. In particular, bankruptcy law provides for very different treatment of unsecured and secured debt, leasing contracts, and the focus of this paper, a newer form of financing known as asset-backed securities (ABS). To the extent that capital structure affects investment decisions, the choice among these instruments can have important effects on firm value.

ABS is now used by many large corporations in the U.S. as a principal financing method. While the use of securitization has been traditionally associated with financial institutions as a means of economizing on regulatory capital requirements, many unregulated financial and non-financial firms also employ the technique. Indeed, recent empirical research (Calomiris and Mason 2004, Minton, Sanders and Strahan 2004) confirms that securitization seems motivated more by efficient contracting motives rather than by regulatory arbitrage. These findings raise an important question: what can securitization achieve that other contracts can not? Addressing this question first requires an understanding of the unique institutional features of ABS contracts.

In terms of its design, ABS most resemble secured debt. Like in a traditional secured loan, the firm uses its existing assets (such as accounts receivable) to back a loan. As a consequence, investors in ABS need be concerned primarily with the quality of the assets

backing the loan rather than the firm's assets as a whole. Unlike secured debt, however, securitization involves the transfer of ownership of these assets to a separate legal entity (a special purpose vehicle, or SPV) which then sells claims on the assets to outside investors in exchange for liquid funds.[1]

Understanding the value of the SPV as an intermediate issuance vehicle between the firm and the investors is crucial to understanding what makes ABS unique. The transfer of ownership of the underlying assets to a separate legal entity allows the firm to establish the *bankruptcy remoteness* of the SPV and the transferred assets. Herein lies the effective difference between secured debt and ABS. When the borrowing firm files for bankruptcy, assets that serve as a collateral for the debtor's secured loan are considered part of the bankruptcy estate. Contrary to the common assumption in the contracting literature that the creditor can seize the collateral on demand, these assets are subject to an automatic stay which restricts the lender's collection rights. The collateral can then be used to support the firm's reorganization, provided the secured lender is given "adequate protection", a flexible standard determined by a bankruptcy judge. In contrast, assets that were transferred in a "true sale" to the SPV are not considered part of the debtor's bankruptcy estate, but instead, continue to be used for the benefit of the SPV investors.

The additional creditor rights provided by this bankruptcy avoidance mechanism has significant impact on the transaction: rating agencies assess the credit quality of ABS based on the likelihood that courts will consider the transaction a true sale instead of a secured loan, and significant legal effort is made to ensure that the collateral will indeed be kept separate from a bankrupt borrower.[2] In light of this special feature of ABS, it is apparent that in order to analyze its use as a distinct financing tool, we need a framework that explicitly models the difference between ABS and other "debt-like" securities in bankruptcy.

[1] One may also argue that a second key difference between ABS and secured debt is that the secured creditor has recourse to the firm's other, non-collateralized assets, while the ABS investor does not. This difference is not as clear as it may seem, however, because the SPV is often "overcollateralized" with the firm retaining an equity interest in the SPV. Secured debt can also be made non-recourse by contract.

[2] See for example, Standard & Poor's "Legal Criteria for Structured Finance Transactions," April 2002. For an account of the response of rating agencies to a key court decision that shed cloud over the likelihood of ever achieving true sale see Weber and MacCallum (1993). In the base model, we will assume that contracting parties can costlessly create a "true sale" if they so choose, which will be upheld in court with certainty. We relax this assumption and consider its implications later in the paper.

This will allow us to generate testable predictions about the types of firms that use these securities and the circumstances in which they will be issued.

We construct a theoretical model that begins with an owner-manager who raises capital in a competitive credit market. The owner-manager chooses a capital structure at date zero to minimize his overall financing cost, thus maximizing his payoff if the firm succeeds. The equilibrium cost of outside funds will depend on the expected outcome should the firm be forced into bankruptcy at date one. Whether the firm is able to reorganize or liquidate in bankruptcy will depend on its ability to obtain new financing, which depends on both the quality of its ongoing projects, and its initial capital structure decision. Because existing claims are costly to renegotiate, and managers have a bias toward continuation of the firm, two possible sources of inefficiency may arise: the firm may continue inefficiently if it can obtain the necessary financing despite having negative-NPV projects, or it may liquidate inefficiently if it cannot obtain financing despite having positive-NPV projects.

We model, as closely and as parsimoniously as possible, current practices in Chapter 11 bankruptcy with respect to the control rights and priorities afforded to the various classes of claims when a firm is insolvent. Chapter 11-eligible securitizers constitute a substantial proportion of the securitization volume in the U.S.[3] The model also applies, though less directly, to insured financial institutions that are subject to FDIC receivership, and most firms that are subject to bankruptcy outside the U.S., since in these cases creditors also have stronger collection rights in a securitization than with other forms of lending.

Specifically, we follow the law in allowing the bankrupt firm to raise debtor-in-possession (DIP) financing which is senior to existing *unsecured* creditors. As in prior work, (Gertner and Scharfstein (1991), Triantis (1993), White (1989)) this can lead to overinvestment and inefficient continuations in our model.[4] The special priority status of securitization explains why ABS can create value. When the firm chooses ex-ante to securitize rather than to finance with unsecured debt, it is effectively left with fewer assets on its balance sheet and would

[3] In Tables 1-3, we document the fraction of securitization undertaken by financial and non-financial firms, by number of firms and by dollar volume, and an industry-level breakdown. The fraction of non-financial securitization volume can be seen as a lower bound for Chapter 11 eligibility, since many financial firms are not FDIC-insured and thus eligible for Chapter 11 as well.

[4] Empirical research (Dahiya et al. (2003), Carapeto (2003)) also finds a positive relationship between DIP financing and the likelihood of reorganization.

require a commensurately larger infusion of cash in order to avoid liquidation. Effectively, since the assets backing the claims of the ABS investors are not part of the bankruptcy estate of the firm, DIP financing cannot prime them. All else equal, this reduces the incentives of the DIP lender to provide new funds, which can mitigate the excess continuation problem inherent in the bankruptcy law.

Of course, this feature by itself does not create a unique role for ABS in the capital structure, since secured debt also enjoys some protection from dilution by a DIP lender[5]. Following practice, we model the difference between ABS and secured debt by the different cash flow and control rights given to the lender when the firm goes bankrupt. With ABS, the SPV, run in the interests of its investors, owns the underlying assets and cannot be forced to surrender them to the firm. With secured debt, the law restricts the lender's collection rights, providing the secured creditor with less protection than a comparable ABS investor would receive. This implies that lenders operating in a competitive market will require higher interest rates on secured loans than on an equivalent ABS issuance.

The main results of the model are as follows. First, we find that ABS is most valuable when the underlying assets are *replaceable* assets such as accounts receivable or other non-specific inputs; i.e. assets that the firm can easily obtain from outside sources at a competitive price. In such circumstances, ABS provides maximal protection to creditors and subjects the bankrupt firm to a more stringent market test in order to receive new funds. When more of the existing assets-in-place are sold, the DIP lender's investment decision depends more on the quality of the firm's ongoing projects and less on his ability to dilute the claims of existing creditors. With respect to *necessary assets*, such as fixed assets, inventory, or intangibles, we find that ABS can produce significant ex-post inefficiencies which raise the firm's overall cost of capital. When the securitized assets are essential to the firm's ongoing operations, the ABS investors have significant hold-up power over the firm. The attempt to exploit this power can lead to inefficient liquidations if ex-post bargaining is subject to imperfections.

In the case of necessary assets, we show that secured debt and/or leases can be preferred

[5]Section 364(d) of the Bankruptcy Code allows the DIP lender to obtain a priming lien over existing secured creditors if necessary. Since this provision is rarely used in practice, we will not assume this is always available to the firm.

to ABS, because investors' holdup power is reduced. With secured debt, the creditor's rights are determined during the bankruptcy process, and vary with the realized liquidation value of the collateral. With leases, the firm is given an option to keep the underlying assets by assuming the lease, if it maintains the payments specified in the initial contract. We show that secured debt, because of its flexibility, is likely to be preferred when the liquidation value of the collateral is more uncertain. On the other hand, secured creditors are subject to dilution in bankruptcy that can lead to excess continuations. Lessors' rights, which are determined contractually, are more protected from dilution than secured creditors, but offer less ex-post flexibility than secured debt.

Our theoretical model relies on the special protection provided by "bankruptcy remoteness" to distinguish asset-backed securities from contracts like secured debt. Under current U.S. law, however, contracting parties attempting to isolate assets from bankruptcy are exposed to the risk that a bankruptcy court might recharacterize a securitization as a secured loan, undermining the special protection that ABS provides. We show that an increased risk of recharacterization results in lower overall efficiency and higher interest rates for ABS investors in equilibrium.

In the empirical section of the paper, we test the prediction that increased recharacterization risk increases credit spreads for ABS investors. Our strategy uses a natural experiment provided by a bankruptcy court decision in which an ABS transaction was effectively recharacterized as secured debt. In the Chapter 11 bankruptcy of LTV Steel in late 2000, the bankruptcy judge issued an interim order allowing LTV to use securitized assets as cash collateral in support of its reorganization, effectively treating the transaction as a secured loan. The decision caused substantial uncertainty in the ABS market, because it cast doubt on the "true sale" status of securitized assets and the ability to guarantee bankruptcy remoteness in ABS deals.

Using a difference-in-differences approach, we compare ABS spreads over maturity-matched swap rates in the six month period before and after the LTV decision for a panel of depository and non-depository institutions that securitized assets during this period. Insured depository institutions are not eligible for Chapter 11; the insolvency procedure for these institutions is governed by the FDIC. FDIC receivership rules, in effect before the LTV

bankruptcy, explicitly prohibit recharacterization of securitized assets of the kind that occurred in the LTV case. Thus, we expect that the LTV decision should have had a positive effect on spreads only for non-depository securitizers if bankruptcy remoteness is indeed an important factor in the pricing of these contracts.

Consistent with our theoretical model, we find a significant difference-in-differences, whereby the spreads on ABS issued by non-depository institutions increased by 25-29 basis points more than the control group in the period following LTV. The effect is strongly statistically significant and is robust to alternative specifications and the inclusion of relevant control variables. In addition to confirming a qualitative prediction of the model, the LTV experiment demonstrates that "bankruptcy remoteness" is a crucial and quantitatively important feature of securitization that can lower a firm's overall cost of capital.

This paper adds to a growing literature on securitization by focusing on the trade-offs in establishing "bankruptcy remoteness", which has not featured prominently in the literature to date. Greenbaum and Thakor (1987) focus on signalling benefits of securitization, while Pennacchi (1988) motivates securitization based on regulatory capital motives. Both Fulghieri (1993) and Iacobucci and Winter (2005) argue that securitization can economize on managerial effort by the securitizing firm by eliminating effort-insensitive assets from the firm's balance sheet, while the latter paper and Hill (1996) argue that securitization alleviates lemons costs of external finance by isolating claims on transparent assets. Gorton and Souleles (2005) analyze implicit recourse in securitization as a means of alleviating adverse selection. In their model, securitized assets are spared a fractional bankruptcy cost which justifies the formation of SPVs. Our model endogenizes these bankruptcy costs and explains why securitization is able to avoid them. Importantly, in our model securitization can potentially *increase* bankruptcy costs, depending on the type of asset being securitized.[6]

The rest of the paper is organized as follows. In the next section we present our theoretical model and examine the effects of bankruptcy law on investment incentives. We show that the possibility of priming existing creditors may result in inefficient over-investment. In section 3 we show how securitization works to mitigate this inefficiency. In section 4 we contrast ABS

[6] Our model is also closely related to Eisfeldt and Rampini (2005) who motivate the differences between secured debt and leases, as we do, based on differential treatment under bankruptcy law. Their model does not consider securitization, however.

with the external financing instruments that most resemble it - secured debt and leases. In section 4 we discuss recharacterization risk and its effects on investment efficiency and credit spreads in the ABS market. Section 5 tests one of our model's predictions and provides empirical support for the effects of bankruptcy remoteness using ABS data around the LTV bankruptcy. In Section 6, we outline the implications of our results for the regulatory policy towards securitization. Section 7 concludes.

2 Model Setup

We consider a two-period model where a wealthless owner-manager owns an investment project which requires an initial fixed cash outlay of I_0 at period 0 from outside investors.[7] The outside investor(s), which operate in perfectly competitive markets, are given claims on the project which require a total (expected) repayment of F at period one[8]. The outside claims can be of several types, which we summarize below. The project produces a random cash flow at period 1 of either $X_1^h > 0$ (with probability p_1) or 0 (with probability $1 - p_1$).

To focus on issues surrounding bankruptcy, we assume that if X_1^h is realized, the firm repays its creditors, no assets remain in the firm, and the game ends at that point. If the bad outcome is realized, the firm is illiquid and thus files for bankruptcy. When the bad outcome is realized, the firm may still have assets-in-place, and a new project that requires investment of new funds.

When the firm files for bankruptcy protection it can either be liquidated (the new project is cancelled and the assets are sold to pay creditors) or be given a chance to reorganize (the new project is funded). The piecemeal liquidation value of the firm's assets-in-place, denoted L, consists of two components: the assets that are *necessary* for the firm's reorganization, whose (possibly random) value is denoted by L_n^j, and those that are *replaceable*, with (pos-

[7] We assume the firm's outside claims are issued simultaneously at period 0 rather than sequentially, but this does not imply that the results hold only for startup firms. Pre-existing investors could include protective covenants or put options in their contracts that could achieve similar outcomes to a simultaneous negotiation at period 0. Importantly, however, such contracts are not permissible in bankruptcy.

[8] Note that securitization is different from standard debt contracts in that the capital providers (the SPV and its investors) purchases assets; hence, the investors' upside is not limited as with a debt contract. Thus we use the phrase "expected repayment" to note that F is not necessarily fixed in advance, but may instead depend on the ex-post realized value of securitized assets. Since all parties are risk-neutral here, this distinction has no economic effect in our model.

sibly random) value L_r^j, so that $L = L_n^j + L_r^j$. The liquidation values of the necessary and replaceable assets are independent and have a binary distribution, with $L_n^j \in \{L_n^l, L_n^h\}$, where $L_n^h > L_n^l$ and $\Pr(L_n = L_n^h) = \lambda$, and $L_r^j \in \{L_r^l, L_r^h\}$ where $L_r^h > L_r^l$ and $\Pr(L_r^j = L_r^h) = \gamma$. Replaceable assets are assets such as accounts receivable and other cash-equivalents, which may be essential to keep the firm running, but need not be provided by a specific source. We assume that replaceable assets can always be bought in a competitive marketplace at their liquidation value. Necessary assets are assets such as unique production facilities, intangible assets such as patents and trademarks, or inventory stocks, which are critical to the firm's ongoing business but can not be replaced easily without substantial cost or delay. For example, if the inability to ship inventory to a customer in a timely fashion damages a firm's reputation substantially, it may result in an eventual liquidation. In such circumstances, even if the inventory is not a unique product, it may be necessary for the firm to have immediate access to it in order to reorganize successfully. Unlike replaceable assets, we assume the necessary assets must be in the firm's control if it seeks to reorganize. We assume that it is prohibitively difficult to write a contract that conditions creditors' rights on L_n^j or L_r^j, since these values will not be realized if the firm continues; this makes them imperfectly observable by a court. We assume, however, that L_n^j and L_r^j will be observable to all contracting parties at period one.

Continuation requires a fixed additional investment of cash and the necessary assets. We assume the firm's existing creditors are passive creditors; thus, their claims cannot be renegotiated and the required continuation investment must come from an outside debtor-in-possession (DIP) lender, who operates in a competitive lending market.[9] We assume that managers have a bias toward continuing the firm's operations, so the firm will always reorganize if it can find the required funds. If the firm reorganizes in bankruptcy, it pursues the new project which yields a random cash flow at period 2 of X_2^h with probability p_2 or $X_2^l < X_2^h$ with probability $1 - p_2$. The parameter p_2 summarizes the going-concern value of the firm; only the distribution of this variable is known as of period zero, which for simplicity is distributed uniform over the interval $[p_2^l, p_2^h]$. As with the liquidation values, we assume

[9] In order for the model to work, we require only that the DIP lender is not the only pre-petition lender so that he does not internalize the entire value of the existing debt; this will be sufficient to generate excess continuations.

that contracts cannot be written on p_2, which is observed by only the manager and the DIP lender at period one.[10]

The required additional cash investment is denoted by K, so that when the firm has replaceable assets (cash and receivables) in the bankruptcy estate worth L_r^j, it needs to obtain $K - L_r^j$ from outside investors and have control of the necessary assets in order to continue.[11] For simplicity, we assume that $K - L_r^j > 0$, so that the firm always requires outside cash to continue. Figure 1 illustrates the timeline of the model.

We restrict attention (without loss of generality) to outside finance that has priority over the owner-manager in the event of default; thus the manager will not receive any cash if the first period project fails, regardless of whether the firm reorganizes.[12] Even though the creditors will bear the losses from inefficient investment ex-post, they will anticipate this and demand ex-ante compensation through higher F. In equilibrium, the manager will bear the costs of inefficiency. Given these assumptions, the owner-manager's maximization problem in period zero is simply to minimize F, the total amount owed to creditors following a success, since the manager's expected payoff is $E(p_1(X_1^h - F))$. This is accomplished by choosing capital structure in a way that minimizes the expected losses from inefficient investment decisions in bankruptcy.[13]

2.1 Financing Instruments

We will consider four types of fixed income instruments the firm can issue to creditors in exchange for cash: unsecured debt, secured debt, leases, and asset-backed securities. We describe the properties of each of these instruments in turn, focusing on their respective

[10] Assuming that the DIP lender has better information than other creditors is motivated by patterns in practice; DIP lenders are usually active creditors such as banks that often have prior relationships with the firm.

[11] We assume that all assets are either perfectly replaceable (can be bought with cash in a competitive marketplace) or necessary (can be obtained from another source only at a very costly price). In reality, of course, the distinction between necessary and replaceable assets is not as polar as we present it here.

[12] Even though such contracts are not *uniquely* optimal here, they are optimal in most settings.

[13] We should note that we do not explicitly include a managerial private benefit of continuation, as in many models of capital structure. In practice, the original managers are usually replaced in bankruptcy, so we believe it is more realistic not to include such benefits in the utility function of the manager who chooses the firm's capital structure at date zero. Introducing such private benefits for a new manager would not change the solution to the problem; however, our definition of efficiency would correspond to ex-ante investment efficiency, but not necessarily ex-post investment efficiency.

rights in bankruptcy.[14]

Equity is junior to all other claims in bankruptcy. For simplicity, we assume that only the manager holds equity, which will always receive nothing in any bankruptcy outcome and will only be paid if the first period project succeeds.[15]

Unsecured debt is senior to equity but junior to secured debt. Unsecured debt is also junior to the DIP lender. Unsecured creditors are subject to the automatic stay; thus, they cannot force the firm to liquidate if it can obtain DIP financing.

Secured debt is senior to unsecured debt and its seniority to the DIP is a function of the realized liquidation value of the collateral. If the face value of the secured claim exceeds the value of the collateral, the remainder is treated as unsecured debt. Because secured creditors are also subject to the automatic stay, they can not seize their collateral if the court determines that they receive *adequate protection*; this standard is subject to court discretion. As we will discuss in detail in Section 4, adequate protection does not guarantee secured creditors the full value of their collateral if the firm continues.

Leases provide the firm with a call option on the underlying asset. If the firm assumes the lease, it must make the contractually specified repayment F^L in full. Thus, leases are senior to DIP lenders and unsecured creditors. If the repayment is made, the lessor cannot seize the underlying asset. If the firm rejects the lease, the lessor seizes the underlying asset and thus receives its liquidation value. Any difference between the face value F^L and the realized liquidation value is treated as unsecured debt.

Asset-backed securities (ABS) involve a sale of the underlying assets to an SPV in exchange for cash. The SPV's outside investors have debt and equity claims on the SPV, but not on the firm.[16] We assume the SPV is always run in the interests of its outside

[14] Given that the main goal of the paper is to compare ABS to other securities based on their treatment in bankruptcy, we cannot adopt a mechanism design approach and solve for optimal contracts. Thus, we necessarily restrict our analysis to a menu of real-world contracts whose treatment in bankruptcy can be realistically characterized.

[15] While deviations from absolute priority in favor of equity are well-documented in bankruptcy, they are becoming increasingly rare (Baird and Rasmussen (2004)).

[16] In practice, the firm may choose to *overcollateralize* the SPV. The firm retains a residual claim on the sold assets, so that after the SPV's debt investors are paid in full, the firm receives the remainder. This equity tranche serves as a cushion to absorb any shortfalls in the cash flows the assets generate. We do not model this explicitly because overcollateralization is not optimal in our model. We discuss the reasons for this in section 3.

investors (i.e. it is independent from the firm). Since the underlying assets are sold, they are not subject to the automatic stay. Thus, the SPV investors control the assets and are senior to all other claims on the firm up to the value of the assets. When the firm defaults, the SPV may sell the assets back to the firm at a price which maximizes the returns of the SPV investors. We assume these investors are arms-length investors, so they do not observe the firm's going-concern value at period two, but do observe the liquidation value of the collateral.

We will now focus on the second period problem, when the firm enters bankruptcy. In order to understand the features of each of the securities above and to understand their effects on investment incentives in bankruptcy, we introduce each of them separately in the following sections. We then proceed to a discussion of optimal capital structure, in which multiple securities can be issued, in Section 4.3.

2.2 Unsecured Debt Only: The Second Period Problem

To generate some intuition about the impact of debtor-in-possession financing on investment, we start with the case where the firm finances itself entirely with unsecured debt. As we will see, this capital structure will be strictly sub-optimal, because it results in excessive continuations. This occurs because the ability to dilute unsecured creditors by issuing senior claims makes investment relatively attractive to the DIP lender/manager coalition.

Recall that when the firm enters bankruptcy, it can either be liquidated or reorganized. If it is liquidated, the assets in the estate are worth $L = L_r^j + L_n^j$. If the firm reorganizes, it requires an additional cash input of $K - L_r^j$. Thus, the going concern value of the firm is $p_2 X_2^h + (1-p_2)X_2^l - (K - L_r^j)$. We define the difference between the going-concern and liquidation values of the firm to be the *going concern surplus.* Continuation will be efficient if and only if the going concern surplus is positive (we will refer to this inequality as the "*efficiency condition*").

$$p_2 X_2^h + (1-p_2)X_2^l - K - L_n^j \geq 0 \tag{1}$$

To make the problem interesting, we assume that for some p_2, continuation is always

efficient ($p_2^h X_2^h + (1-p_2^h)X_2^l - K - L_n^h > 0$) and for some p_2, liquidation is always efficient ($p_2^l X_2^h + (1-p_2^l)X_2^l - K - L_n^l < 0$). When the DIP lender is willing to participate, he lends $K - L_r^j$ and takes a debt claim with face value F^D. Following the rules of Chapter 11, the bankruptcy court allows the DIP lender to be senior to the existing unsecured creditors.

The unsecured creditors' payoff in continuation is therefore $max\{X_2^j - F^D, 0\}$ and the DIP lender's payoff is $min\{F^D, X_2^j\}$, where $j \in \{l, h\}$.

In this scenario, the DIP lender's participation constraint (which we refer to as the "*continuation condition*" since it determines whether or not the firm is able to reorganize) is given by

$$p_2 X_2^h + (1-p_2)X_2^l - (K - L_r^j) \geq 0 \tag{2}$$

since the firm can offer the DIP lender a face value as high as $F^D = X_2^h$.[17]

In comparing the efficiency and continuation conditions, it is straightforward to verify that continuation will always occur when it is efficient. On the other hand, inefficient continuations may occur if (2) is satisfied but (1) is not. This is the familiar overinvestment problem captured in Gertner and Scharfstein (1991) and White (1989), that results from senior financing in bankruptcy. In such a situation, continuation occurs despite being inefficient, because the DIP lender is able to transfer sufficient wealth from existing unsecured creditors through dilution of their claims. Inefficient overinvestment is more likely to occur when $L_r^j = L_r^h$, since the DIP lender's required investment is smaller. In essence, the DIP lender uses more of the firm's existing assets (which would otherwise be paid out to unsecured creditors) to support the reorganization. Inefficiency is also more likely to occur when $L_n^j = L_n^h$; in this case, the opportunity cost of the necessary assets is higher, which the DIP lender does not internalize. Since the DIP lender always earns zero profit in equilibrium, and equity receives nothing, the going concern surplus generated by a DIP loan, $p_2 X_2^h + (1-p_2)X_2^l - K - L_n^j$ (which may be negative or positive) accrues entirely to the existing unsecured creditors.

[17] In practice, the court can limit the interest rate the firm offers the DIP lender if it is excessive. This is of no consequence here, however, since our assumption of perfect competition limits the profits earned by the DIP lender to zero.

We now turn to the effects of securitization, which can limit the excess continuations problem by guaranteeing the seniority of existing creditors.

3 The Effect of Securitization

When the firm undertakes securitization at period zero, assets are sold to an SPV in exchange for cash provided by outside investors who receive in return ABS issued by the SPV. Securitization is commonly referred to as a left-hand-side balance sheet financing method. Instead of increasing both sides of its balance sheet when debt is issued, the firm obtains the required cash by selling existing assets on its balance sheet for cash. While the accounting for these transactions is not relevant for our model per se, the legal ownership of the securitized assets will be crucial because it will affect the ability of the firm to obtain DIP financing. Securitization affects the size of the bankruptcy estate at period 1 in case the first project fails, and by extension, the funds the firm must raise in order to continue.[18]

We now proceed to analyze the effect of securitization on ex-post efficiency at bankruptcy. The effect of securitizing will depend greatly on whether the assets are replaceable or necessary.

3.1 Securitization of Replaceable Assets

We begin by analyzing a firm that has only replaceable assets ($L_n^j = 0, \lambda = 0$). When the firm securitizes part of its assets, the required outside investment at bankruptcy, as noted above, also depends on the level of securitization. Assume the firm securitizes a fraction φ of its asset base. In order to continue at bankruptcy, the firm will then need to raise $K - (1 - \varphi)L_r^j$ to continue. The continuation condition becomes

[18] When the firm undertakes securitization, as opposed to debt issuance at period 0, it effectively breaks down its balance sheet into two separate balance sheets - one that will be part of an eventual bankruptcy estate and another which will be insulated from a bankruptcy procedure. When true sale is achieved, the firm cannot use the assets on the SPV's balance sheet in order to pursue the second project since those assets are not considered part of the bankruptcy estate. In order to continue the firm therefore needs to obtain larger amount of cash infusion from outside lenders, which decreases the likelihood of obtaining the sufficient amount, and as a result, the likelihood of continuation.

$$p_2 X_2^h + (1 - p_2) X_2^l - (K - (1 - \varphi) L_r^j) \geq 0 \tag{3}$$

Recall that in choosing the capital structure at date zero, the owner-manager seeks to guarantee ex-post efficient outcomes if possible, since this minimizes his repayment conditional on success. With no necessary assets, the efficiency condition is

$$p_2 X_2^h + (1 - p_2) X_2^l - K \geq 0 \tag{4}$$

It is easy to verify that the two conditions are equal if and only if $\varphi = 1$. In other words, when the firm securitizes all its assets-in-place, continuation occurs if and only if it is efficient. This is stated formally in the following proposition:

Proposition 1 *When the firm has no necessary assets, it is optimal to securitize all assets-in-place (i.e. the value of securitized assets equal L_r^j), and bankruptcy outcomes are always ex-post efficient.*

Proof. See Appendix. ■

As proposition 1 affirms, setting the level of the assets sold to the SPV equal to L_r^j (which amounts to securitizing all the firm's assets-in-place)[19] guarantees efficient outcomes ex-post. The gains from securitization can be thought of as project finance in reverse, in that the transaction allows the firm to separate its new investment opportunity from its existing asset base by removing the assets instead of the growth opportunity. Securitization guarantees that the decision to adopt the new project is not subject to investment distortions created by the assets-in-place[20]. When the firm securitizes its entire asset base, outside investors must provide the entire required investment K to continue, and they can be promised all the proceeds. This gives the firm and the DIP lender the proper incentives with respect to the continuation decision.[21]

[19] Note that the assumption of no necessary assets in this section refers to physical assets only. This does not rule out that firm may have necessary intangible assets such as human capital, reputation, etc. that can result in the firm having a growth option despite having no tangible assets on its balance sheet.

[20] See Berkovitch and Kim (1990) who justify project finance in a similar framework.

[21] In terms of the first period problem, the assumption of competition pins down the solution. If I_0 is greater than the ABS investors' expected payoff, the ABS investors contribute initial capital such that they break even, and we assume the remainder is contributed by unsecured creditors. Second, if I_0 is less than

While securitizing all of the firm's existing assets might seem to be a non-conventional idea, this phenomenon has been growing in importance. Whole Business Securitization (WBS) involves the transfer of the entire assets of the firm, or the rights to the future cash flows generated by these assets, to a separate legal entity which in turn issues claims for outside investors backed by the assets. An example of WBS[22] is a deal executed by Triarc Companies, a holding company that, through its subsidiaries, is the franchisor of Arby's restaurants. Every Arby's restaurant is owned and operated by an independent franchisee that pays both franchise fees and royalties. Triarc structured a transaction where the rights for all the future cash flows stemming from the franchise fees and royalties paid by Arby's franchisees were transferred into a separate legal entity that financed such transactions with funds raised from various institutional investors.

In comparing the result in Proposition 1 to securitization patterns in practice, one additional feature is worthy of mention. ABS issuances are often over-collateralized, such that the firm actually retains the equity position in the SPV. One reason for this structure is to eliminate adverse selection problems that arise when the firm has superior information about the quality of the sold assets (Leland and Pyle (1977)). An equity stake in the SPV may also alleviate a moral hazard problem that arises if the firm is required to monitor and service assets it does not own (see Pennacchi (1988), Riddiough (1997), Gan and Mayer (2005)).

To focus the model on bankruptcy remoteness in ABS transactions, we abstract from these moral hazard and adverse selection problems that can occur in practice. Proposition 1 is relevant to the issue, however, since it demonstrates that retention of an equity position to solve these problems can come with a cost; namely, that ex-post efficiency at bankruptcy can suffer. When the firm is entitled to the residual funds from the SPV's assets, the firm might use them to support a reorganization, to the detriment of ex-post efficiency.[23] We expect, then, that the firm will trade-off these inefficiencies, or look for alternatives to overcollateralization to solve adverse selection and moral hazard problems. For example,

this expected payoff to ABS investors, they will contribute more than I_0, and the manager will pay himself a dividend equal to the excess.

[22] In the U.S. such transactions are sometimes referred to as "operating company securitizations."

[23] In such a case, assuming the firm securitized all its assets-in-place, the continuation condition becomes $p_2 X_h^2 + (1-p_2)X_l^2 - K + \theta \geq 0$, where θ is any residual funds from the SPV, and inefficient continuations might occur similar to the situation discussed in section 2.2.

rating agencies can alleviate adverse selection problems by generating information about the underlying assets. This implies less need for the firm to retain the SPV's equity position and capital structure can be used to better alleviate the continuation bias inherent in the bankruptcy law.

This intuition can also help explain a trend over time in securitization practice toward lower levels of overcollateralization. As the securitization market has developed, and longer histories of performance of securitized assets are available, the costs of asymmetric information in securitization issues are plausibly decreasing over time. This implies that the firm can focus less on issuing safe outside claims, and more on the commitment role of ABS in preventing inefficient bankruptcy outcomes. Our model suggests that this is achieved by securitizing more of the firm's replaceable assets.

3.2 Securitization of Necessary Assets

Proposition 1 shows that to achieve ex-post efficiency in bankruptcy, the firm should securitize all its assets when the assets are entirely replaceable. This allows the firm to commit to investing in bankruptcy if and only if it is efficient. We now show that the situation is quite different when some assets are necessary for the firm's survival.

Recall that we define necessary assets as those the firm needs in order to pursue its ongoing projects, and are too costly to replace with substitutes. Since securitization is effectively a sale of an asset, the SPV obtains ownership rights to the asset. This implies that in bankruptcy, the SPV has legal rights of control in addition to cash flow priority over the DIP lender. If the firm needs the securitized assets to reorganize, it must repurchase them from the SPV, run in the interests of its lenders.[24]

In this section, we model the costs of giving lenders control over necessary assets by assuming that ex-post bargaining is subject to frictions due to asymmetric information. In practice, information asymmetry is likely to exist between the debtor/firm and the SPV,

[24]SPVs are usually structured to make sure they are operated for the benefit of its outside ABS investors, especially in case the borrowing firm goes bankrupt. This is achieved by the appointment of independent directors to the SPV's board, by the use of trustees who represent the ABS investors' interests, or, more recently, by the use of special SPV management firms that run the SPV independently from the borrowing firm. See Ellis (1999) and Cook and Della Salla (1998).

which is represented by a third-party trustee. The trustee is usually a specialized division of a major bank, and would plausibly have less information about the going concern value of the firm than a DIP lender, who often has an ongoing relationship with the firm. While we model one potential channel, inefficiencies associated with transferring control over necessary assets could arise through other channels as well. For instance, the familiar hold-up problem (Grossman and Hart, 1986) can lead to inefficient ex-ante underinvestment even if ex-post bargaining is assumed to be efficient.

We assume that the SPV (or the trustee that acts on behalf of its investors) is not informed about the realization of p_2 and knows only its distribution. Knowing that the firm requires the necessary securitized assets, we assume the SPV makes a take-it-or-leave-it offer to the firm that maximizes its expected surplus. If the firm rejects the offer, it proceeds to liquidation. Though this specification of the bargaining game is chosen for its analytical simplicity, any bargaining game that leads to inefficiency due to asymmetric information (such as costly delay[25]) would lead to similar costs.

If the firm securitizes all assets in period zero, the timeline of the bargaining process following a period one failure is as follows:

1. SPV makes an offer to sell the necessary asset back to the firm for M^j dollars where $j \in \{l, h\}$. This will depend on the liquidation value of the necessary assets, which the trustee can observe.

2. The DIP lender decides whether to lend $K + M^j$ to the firm in exchange for a debt claim F^D. If not, the firm liquidates.

The SPV investors choose M^j optimally to maximize their expected surplus. Recall that p_2 is distributed $U[p_2^l, p_2^h]$.

The SPV's problem is the following:

$$\max_{M^j} \Pr(\text{offer is rejected}) L_n^j + \Pr(\text{offer is accepted}) M^j \tag{5}$$

$$= \max_{M^j} \frac{p_2(M^j) - p_2^l}{p_2^h - p_2^l} L_n^j + \frac{p_2^h - p_2(M^j)}{p_2^h - p_2^l} M^j \tag{6}$$

where $p_2(M^j) \equiv \frac{M^j + K - X_2^l}{X_2^h - X_2^l}$, the minimum firm quality for which the DIP lender's partic-

[25] see, for example, Rubinstein (1985)

ipation constraint can be satisfied given the offer price M^j.

Solving this problem yields the SPV investors' optimal offer price to the firm:

$$M^{j*} = \frac{1}{2}(p_2^h X_2^h + (1 - p_2^h)X_2^l - K) + \frac{1}{2}L_n^j$$

Since the going concern surplus is always positive when $p_2 = p_2^h$, $M^{j*} > L_n^j$. Analyzing this offer, we can see that M^j is increasing in p_2^h but not p_2^l. Thus, for a given expected continuation value, greater information asymmetry increases the offer price of the SPV. As the next proposition shows, the SPV's optimal offer price results in excessive liquidations.

Proposition 2 *If the firm securitizes necessary assets, there exist* $p_2 \in [p_2^l, p_2^h]$ *such that* $p_2 X_2^h + (1 - p_2)X_2^l - K - L_n^j > 0$ *and* $p_2 X_2^h + (1 - p_2)X_2^l - K - M^{j*} < 0$; *the firm liquidates despite continuation being efficient.*

Proof. See Appendix. ■

Inefficient liquidations occur because it is too costly for the firm to continue without its necessary asset. In an attempt to extract more surplus for its investors on firms with significant going-concern value, the SPV offers a price that will be rejected for firms with positive, but small going-concern surplus.[26]

The LTV Steel bankruptcy, while providing a natural experiment on the impact of bankruptcy remoteness, also illustrates the particular problems a firm may face when it securitizes necessary assets.[27] Prior to filing for bankruptcy, LTV had two securitization structures in place. Its accounts receivable were sold to an SPV which was financed primarily by Abbey National Bank, and its inventory was sold to an SPV financed primarily by Chase Manhattan Bank. As LTV moved closer to the bankruptcy filing, it began negotiations with these

[26] The reader might anticipate that this potential ex-post bargaining cost is not specific to bankruptcy states, and might occur even in the good state. While this is possible, we expect the conditions we model here to be more prevalent when the firm is in distress. First, the inability to reach a timely agreement over access to necessary assets is likely to be more costly in bankrutpcy, when the firm's prospects are more tenuous and a negative event could result in workers, suppliers, etc. abandoning the firm. Second, uncertainty about the going-concern value of the firm (which generates the inefficiency) is likely to be larger, since the firm's prospects have deteriorated to a degree that may be uncertain.

[27] For a detailed account of the facts surrounding LTV Steel's bankruptcy, see a special report by Moody's Investors Service entitled "True Sale Assailed: Implications of In re LTV Steel for Structured Transactions," (April 27, 2001). Below, we provide a succinct description of the case's salient details that are relevant for our model.

banks, but the negotiations subsequently broke down. Needing control over its working capital, LTV filed for Chapter 11 and asked the bankruptcy court for permission to include the securitized assets inside the bankruptcy estate. Their argument was predicated on the notion that LTV could not continue operating without the assets, and that granting the SPV control over them would result in a costly liquidation.[28] The bankruptcy court, siding with LTV, issued an interim cash collateral order that allowed the firm to use the receivables and inventory to support its ongoing operations. The decision created substantial uncertainty in the ABS market about the ability to achieve bankruptcy remoteness, which we discuss in further detail in section 5.

The LTV example illustrates several of the features captured in our model. First, the time inconsistency of managerial behavior is apparent. LTV securitized its working capital to take advantage of the lower cost of financing that follows from bankruptcy remoteness, but management later tried to undermine the securitization in order to continue operating. Second, unlike a more traditional securitization of receivables only, LTV required consent from its securitization lenders, who would have legal control over both receivables and inventory in the event of bankruptcy. Bargaining was not able to produce a speedy resolution prior to its Chapter 11 filing, and the breakdown forced LTV to seek help from the bankruptcy court.

LTV is not the only example of a securitization of necessary assets that faced potential trouble in bankruptcy. Days Inn, a hotel chain, filed for Chapter 11 in the late 1980s. In a WBS transaction, Days Inn had securitized its franchise fees (replaceable assets in our model) but along with it, also sold its trademarks (necessary assets) to the SPV. In bankruptcy, Days Inn found a willing buyer, whose willingness to purchase the company was conditional on owning the company trademarks. This, in turn, required negotiations with the trustee in the SPV. In this case, the company was able to reach a settlement with the trustee that enabled the bankruptcy sale to take place. Nevertheless, commentators have used this example to note the potential problems associated with securitizing necessary assets.[29]

[28] In a brief to the bankruptcy court, LTV claimed that the SPV investors "have attempted to 'opt-out' of the United States Bankruptcy Code to capture the most valuable assets of the Debtors to dispose of as they see fit, at a painful cost to the Debtors' employees, unsecured creditors and shareholders."

[29] See The Committee on Bankruptcy and Corporate Reorganization of the Association of the Bar of the City of New York, 1995, Structured Financing Techniques, 50, *The Business Lawyer*, 527, 563.

With these results in hand, we expect that other existing securities may be preferred when ex-post holdups are possible due to the existence of necessary assets. In the following section we consider two other securities which limit the control rights of the lender in bankruptcy: secured debt, which substitutes court control for creditor control, and leases, which give the firm an option to keep the necessary asset at a pre-determined price. We compare these securities to ABS and each other, and generate comparative statics that can predict their usage.

4 Substitutes for ABS: Secured Debt and Leases

4.1 Secured Debt

As we noted at the outset, some similarities exist between ABS and secured debt. In some sense, because outside investors are given unrestricted rights to the underlying assets in bankruptcy, ABS most resemble the traditional view of debt in classic models such as Hart and Moore (1994). As we saw in the previous section, however, the unchecked power of the ABS investor can result in inefficient liquidations when control of the underlying assets is necessary for the firm's ongoing projects. Secured debt, on the other hand, restricts the lender's control rights in bankruptcy by substituting court-determined protection for creditor control. While this protection, through the automatic stay, is unlikely to improve upon outcomes when the underlying assets are replaceable (since ABS is optimal), we might expect that this can have some benefits in preventing creditor holdup when assets are necessary.

While a complete characterization of the treatment of secured creditors in Chapter 11 would be cumbersome, several features are crucial for our analysis. First, seniority for a secured creditor is based on the realized value of the collateral at bankruptcy, not the face value of their claim. When a secured creditor's claim exceeds the value of the collateral, the remainder of the claim is considered unsecured and can thus be primed by a DIP loan.[30] Also, since the collateral is not actually sold, the valuation is subject to judicial discretion. Judges can potentially bias the outcome of the bankruptcy toward reorganization by undervaluing

[30] 11 U.S.C. §361. See also U.S. Bankruptcy Judge (S.D.N.Y) Robert D. Drain, A Short Summary of Chapter 11 of the United States Bankruptcy Code (2003).

the collateral. Noting this problem, prior literature proposes alternative mechanisms that seek to avoid judicial valuation while limiting creditor holdup power over necessary assets (Adler 2005, Bebchuk and Fried 2001).

Second, given existing practice in Chapter 11, secured creditors are not guaranteed the same payoff in continuation as they would receive in an immediate liquidation, even if the collateral is valued correctly. While secured creditors are allowed compensation for the depreciation of the collateral (through adequate protection payments), they are not fully compensated for the time value of money lost during the reorganization.[31] In this sense, secured creditors' claims are diluted by the time delay inherent in confirming a plan of reorganization.[32] Furthermore, the law also allows for the possibility of "priming liens" that would allow a DIP lender to trump the secured creditor's priority, though this is not used often in practice.

Taken in full, existing rules and practice in Chapter 11 suggest that the guaranteed seniority of secured creditors is less than the liquidation value of their collateral on the bankruptcy date. To model this simply, we assume that (if all the assets are secured) in order to continue the secured creditors must receive a claim with expected value $(1-\delta)\left(L_n^j + L_r^j\right)$, the realization of the liquidation value scaled down by a dilution parameter $\delta \geq 0$. Given that secured creditors lose protection based on the time value of money, it is sensible to assume that the amount of dilution suffered by the secured creditors, $\delta\left(L_n^j + L_r^j\right)$, is proportional to the liquidation value. Under these assumptions, the continuation condition is as follows when all assets-in-place are secured[33]:

[31] Oversecured creditors are entitled to post-petition interest, but this does not increase the overall "supply" of seniority; these payments would be made only up to the value of the collateral. Thus, the overall value that is protected from dilution by the DIP lender is thus bounded above by the value of the collateral. See Ayer and Bernstein (2002).

[32] Ayotte and Skeel (2004,2006) find empirical evidence that secured creditors are important drivers of venue choice in bankruptcy, and exhibit a strong preference for Delaware, which produces significantly faster reorganizations.

[33] If only unsecured and secured debt are allowed, securing all assets-in-place, rather than leaving some assets unsecured, would be optimal.

$$p_2 X_2^h + (1-p_2)X_2^l - (1-\delta)\left(L_n^j + L_r^j\right) - \left(K - L_r^j\right)$$

$$= p_2 X_2^h + (1-p_2)X_2^l - K - L_n^j + \delta(L_n^j + L_r^j) \geq 0$$

Note that when $\delta = 0$, the continuation condition is once again identical to the efficiency condition and ex-post efficiency is obtained. If δ is positive, then financing with secured debt leads to excess continuations, which is greater when the liquidation value of the assets is high. On the other hand, we can see the potential benefit of secured debt relative to ABS, namely its ability to prevent inefficient creditor holdups. If the court-based valuation can exactly match the secured creditor's claim to the liquidation value of the collateral (i.e. $\delta = 0$), then ex-post efficiency can always be achieved.[34] Since the secured creditor does equally well under liquidation and continuation, the DIP lender can not be persuaded to invest by using the dilution proceeds from existing creditors. As the value of δ increases, the corresponding benefits of secured debt are commensurately reduced. Note also that the costs/benefits of secured debt do not depend on whether the assets are necessary or replaceable.

The comparison of ABS and secured debt reveals that secured debt has the potential to alleviate holdup problems introduced by securitization when the assets are necessary, but is imperfect due to the incomplete protection of secured creditors in Chapter 11. However, secured debt is not the only senior financing instrument that can be used to substitute for ABS. In the next section we consider the bankruptcy treatment of leasing contracts and their effects on investment incentives.

4.2 Leases

While secured debt is usually perceived as the highest priority claim in bankruptcy, lessors implicitly receive a higher level of protection. A leased asset is not automatically excluded from the bankruptcy estate if the debtor/lessee convinces the court that the asset is necessary for the continued operation of the firm. In this sense, the bankruptcy treatment is similar to

[34] A second potential source of inefficiency that we do not model would be judicial error in the collateral valuation, which could produce both inefficient liquidation and continuation.

that of collateral backing a secured claim. However, if the debtor keeps the leased asset in the bankruptcy estate, thereby "assuming" the lease, unlike the case of secured debt, it must pay the lessor the contractual payments during and after the bankruptcy case. Alternatively,if the debtor "rejects" the lease, the lessor can foreclose on the asset. In other words, the law protects lessors from adjustments in their contractual rights without their approval.[35]

Recall our assumption that $L_n^j \in \{L_n^l, L_n^h\}$, where $L_n^h > L_n^l$ and $\Pr(L_n = L_n^h) = \lambda$ and $L_r^j \in \{L_r^l, L_r^h\}$ where $L_r^h > L_r^l$ and $\Pr(L_r = L_r^h) = \gamma$. The efficiency condition, as before, is given by

$$p_2 X_2^h + (1 - p_2) X_2^l - K - L_n^j > 0 \tag{7}$$

where $j \in \{l, h\}$.

If the firm uses a lease to finance its assets, it must make the contractually specified payment F_i^L $i \in \{r, n\}$ in order to be able to continue using the assets. If the firm rejects the lease, the lessor repossesses the collateral. If the collateral is a necessary asset, this leads to liquidation of the firm, since by definition the firm must have control of the necessary assets to take advantage of its investment opportunity.[36] Rejection of a lease on replaceable assets does not necessarily lead to liquidation, but increases the amount of cash required from outside investors. The continuation condition under leasing therefore becomes

$$p_2 X_2^h + (1 - p_2) X_2^l - (K + F_n^L) + \left(L_r^j - F_r^L\right)^+ \geq 0 \tag{8}$$

The DIP lender can receive up to the entire cash flow from the project $p_2 X_2^h + (1-p_2) X_2^l$, but must contribute an additional K and assume the lease on the necessary asset at a cost of F_n^L. If the value of the replaceable assets makes assumption of the lease optimal (which occurs when $L_r^j - F_r^L$ is positive), then the required cash contribution is commensurately

[35] The bankruptcy code grants the debtor a (potentially extendable) 60-day period to make a decision about whether to assume or reject the lease, and contains subtle differences in the treatment of personal property leases and real property leases (see 11 U.S.C. §365(d)(3) and §365(d)(10)). These subtleties are unlikely to be consequential for the general treatment of leases illustrated in our model.

[36] For simplicity of exposition, we do not model renegotiation of leases. Under any reasonable specification of a renegotiation game, we expect that the main results concerning leases will hold, namely that: a) leases offer more protection to the firm than ABS, due to the call option, and b) leases provide more creditor protection but less flexibility than secured debt, because the bankruptcy court is not involved.

less. Comparing the efficiency and continuation conditions under lease financing, we observe that inefficient continuations (liquidations) can occur when $F_n^L - \left(L_r^j - F_r^L\right)^+$ is less than (greater than) L_n^j.

Given that all the assets-in-place are financed by leases, we can ask what the optimal contracts $\{F_r^L, F_n^L\}$ would look like. This is summarized in the next lemma.

Lemma 3 *The optimal lease policy sets the lease payment on the necessary assets, F_n^L, equal to the expected liquidation value $E(L_n)$. The lease payment on the replaceable assets, F_r^L, is set such that the lease is always rejected; i.e. the optimal F_r^L is any value such that $F_r^L \geq L_r^h$.*

Proof. See Appendix. ■

The intuition for the result is as follows. In setting the lease payments, the firm would like to commit to a policy that guarantees efficient investment, which requires setting $F_n^L - \left(L_r^j - F_r^L\right)^+$ as close to L_n^j as possible in expected terms. Since the liquidation values $\{L_r^j, L_n^j\}$ are not known when the contract is written, randomness in the liquidation values leads to greater investment inefficiency. Setting $F_r^L \geq L_r^h$ is optimal because it eliminates any noise caused by randomness in the replaceable assets. Note that a lease that is never assumed in equilibrium is equivalent to securitization, since the firm has no remaining rights to the asset.

With this result in hand, the lease payment on the necessary assets is set so that the expected loss from inefficient continuations and liquidations is minimized. This is accomplished by setting F_n^L between the two possible liquidation values of the necessary assets. When the high liquidation value is realized, inefficient continuations can occur, and when the low liquidation value is realized, inefficient liquidations may occur.

Comparing with our earlier analysis, leases have an advantage over secured debt and ABS in the ability to commit to an efficient balance between creditor and firm rights in bankruptcy. The value of secured creditors' claims is affected by the bankruptcy procedure to the detriment of creditors (provided that $\delta > 0$), which leads to inefficient continuations. The value of ABS is determined by ex-post bargaining, to the detriment of the firm, which leads to inefficient liquidations. With necessary assets, the ability to commit to preventing ex-post opportunism makes leasing valuable. This commitment comes at a cost, however,

since the required repayment does not adjust to new information about the liquidation values realized after the contract is written. This inflexibility can also result in ex-post inefficient outcomes. In this sense, leases are inferior to secured debt, which uses the discretion of the bankruptcy judge to match the secured creditor's claims to the realized liquidation value of the assets.

With respect to replaceable assets, our analysis confirms that leases can do no better than ABS, since there is no cost to providing maximal creditor protection for these assets. Giving the firm a valuable option to purchase assets at a pre-determined price is never optimal, since replaceable assets will always be available at a price that reflects their opportunity cost. Adding this option would merely add noise to the continuation decision which an optimal contract seeks to avoid.

4.3 Optimal Capital Structure

In this section, we briefly summarize the costs and benefits of the securities we have analyzed, and then provide some comparative statics on optimal capital structure.

Asset-backed securities

Benefit: Maximal creditor protection. The bankruptcy remoteness of the securitized assets gives creditors control rights that prevent dilution in bankruptcy. ABS is most valuable for *replaceable assets*, where there are no costs to full creditor control.

Cost: Bargaining costs. When assets are *necessary*, giving creditors control rights leads to bilateral bargaining which can be inefficient under asymmetric information. The attempt by creditors to extract more surplus from the firm leads to inefficient liquidations.

Secured debt

Benefit: Flexibility. The judicially-supervised bargaining process under Chapter 11 rules allows the secured creditor's seniority to depend on the realized liquidation value of the assets. This flexibility can improve the efficiency of investment in bankruptcy.

Cost: Dilution. Under current law, secured creditors are not entitled to the same protection in reorganization as in liquidation; this distortion leads to inefficient continuations.

Leases

Benefit: Dilution protection and balance. Like ABS, lease contracts are not

adjusted by the bankruptcy process, which protects creditors. Unlike ABS, the firm is given a call option on the assets, which limits creditor hold-up power.

Cost: Inflexibility. Unlike secured debt, the contract does not adjust to the realized liquidation value, which can produce inefficient over- and under-investment in equilibrium.

Having analyzed each of the components of the firm's capital structure separately to generate intuition, we will now allow the firm to issue multiple securities in order to generate some comparative statics regarding optimal capital structure. We simplify the problem slightly by assuming that each asset type must be financed by one security. The next proposition summarizes our results.

Proposition 4 *For the given parameter values, the following capital structures are optimal:*

a) When $L_n^j = 0$, $\lambda = 1$, *the optimal capital structure is to securitize all existing assets.*

b) As $\delta \to 0$, *the optimal capital structure is to securitize all replaceable assets and issue secured debt backed by the necessary assets, with face value of at least* L_n^h*;*

c) As $Var(L_n) \to 0$, *the optimal capital structure is to securitize all replaceable assets and lease necessary assets with an option to assume the lease at a price* $E(L_n)$.

Proof. See Appendix. ■

Part (a) of the proposition is a restatement of Proposition 1. Parts (b) and (c) point out the main costs and benefits of secured debt relative to leases. As the expected dilution of secured creditors falls, the flexibility benefit of secured debt dominates the commitment value of leases. As the variance of the liquidation value of the necessary assets falls, the cost of leasing disappears and contracts can be optimally set to produce efficient investment without the bankruptcy process. In all cases, it is optimal to securitize the replaceable assets, for which maximal creditor protection is optimal.

In summary, our theoretical analysis points to variations in creditor rights under bankruptcy law as an important driver of firms' optimal capital structure decisions. An optimal capital structure balances control and cash flow rights between creditors and the firm in a way that minimizes the costs of inefficient investment choices in bankruptcy. Asset-backed securities are unique, particularly in comparison to secured debt contracts, in that they maximize ex-post protection of creditors in bankruptcy.

5 Recharacterization Risk: Investment Efficiency and Credit Spreads

So far, we have assumed that any attempt to create a "true sale" will be upheld in bankruptcy court with certainty, in order to demonstrate the value of bankruptcy remoteness in an ideal setting. Under current U.S. law, however, bankruptcy judges are not required to honor the stated intent of the contracting parties, but can instead use their equitable powers to "recharacterize" a securitization if the transaction more closely resembles a secured loan. In this section, we explore the consequences of recharacterization risk on investment efficiency in bankruptcy. We can also derive a qualitative prediction for credit spreads in the securitization market when the risk of recharacterization increases. In the next section, we will test this prediction using evidence from the LTV Steel bankruptcy.

In order to analyze both the efficiency and pricing implications of recharacterization, we need to add a bit more structure to our existing model. For simplicity we will assume, consistent with Proposition 4(b), that the firm securitizes its replaceable assets, and finances its necessary assets with secured debt.[37] If a recharacterization attempt occurs, the replaceable assets will become part of the firm's bankruptcy estate, and the ABS investors with fixed claims on the SPV will become secured creditors of the firm.[38]

Since an attempt to recharacterize a securitization is likely to be contentious and costly, we will suppose that the manager will attempt to do so when recharacterization of the assets is both a necessary and a sufficient condition for obtaining a DIP loan. Formally, these conditions (which we will call the "recharacterization conditions") can be written as follows:

[37] We should be careful to point out that we only analyze recharacterization of replaceable assets. Theoretically, it is possible for recharacterization to be efficiency-enhancing in this model if it is used only with respect to necessary assets and only used to prevent an inefficient bargaining breakdown. Nevertheless, we believe a better normative prescription is to ensure the bankruptcy remoteness of securitization and eliminate the dilution of secured creditors inherent in the bankruptcy code, which would achieve the same goal.

[38] For brevity of exposition, we assume that the firm's balance sheet has only secured and unsecured debt. The inefficiency of recharacterization can also be shown if the necessary assets are leased. In this case, the inefficiency comes not from inefficient continuation only, but from increased inefficiency of both continuation and liquidation. Recharacterization adds uncertainty about the firm's asset value in bankruptcy, which can tax or subsidize reorganization.

$$p_2 X_2^h + (1-p_2)X_2^l - (1-\delta)L_n^j - K \;<\; 0 < \tag{9}$$
$$p_2 X_2^h + (1-p_2)X_2^l - (1-\delta)(L_n^j + L_r^j) - (K - L_r^j)$$

The first inequality says that the DIP lender would choose not to lend if the replaceable assets are not recharacterized, while the second inequality says that the DIP lender is willing to advance funds if recharacterization occurs. Note that since recharacterization allows the DIP lender to use the full value of the replaceable assets to support the reorganization, but the former ABS investor is senior only up to a fraction of that value, recharacterization provides a subsidy of δL_r^j to the reorganization.

We suppose that if an attempt to recharacterize a securitization occurs, a judge will approve the firm's request with probability π and reject with the complementary probability. With this structure in hand, the efficiency consequences of increasing recharacterization risk follow quickly, as we state formally in Proposition 5:

Proposition 5 *An increase in recharacterization risk (π) increases the probability of an inefficient continuation, and hence reduces firm and equity values.*

The essence of the argument is that recharacterization, whenever it occurs, changes the bankruptcy investment decision from an efficient liquidation to an inefficient continuation. The partial dilution of secured creditors gives the DIP lender excessive incentive to invest in an inefficient firm. Since equity and firm values are directly related to the efficiency of bankruptcy investment decisions in this model, a higher likelihood of inefficient continuations in bankruptcy reduces both in equilibrium.[39]

5.1 Recharacterization Risk and Credit Spreads

[39] The character of this result is similar to Che and Schwartz (1999) who find that restrictions on ipso facto clauses also result in inefficient continuation; in both cases, restrictions on the ability to contract around the bankruptcy code lead to the inefficiency.

To consider the effects of recharacterization on credit spreads, consider ABS investors with fixed claims on the SPV with face value F_A.[40] If a recharacterization were to occur, two competing effects determine the investors' ultimate return. First, the dilution of secured creditors by the DIP lender, as we have analyzed, will affect the (former) ABS investors negatively. On the other hand, a recharacterization gives the ABS investors recourse to the firm's assets, to which the ABS investors would not have rights otherwise. To see the effects of recharacterization in notation, we give the investor payoffs below when the SPV owns replaceable assets worth L_r^j:

ABS investor payoffs:

No recharacterization: $\min\{L_r^j, F_A\}$

Recharacterization: $\min\{(1-\delta)L_r^j + \phi(F_A - (1-\delta)L_r^j)^+, F_A\}$

Recharacterization would convert ABS investors into secured creditors, and Chapter 11 rules call for a secured claim F_A to be "bifurcated" into a secured piece which is senior to a DIP lender ($(1-\delta)L_r^j$) and an unsecured piece ($F_A - (1-\delta)L_r^j$) which is junior. The parameter ϕ represents the recovery of unsecured creditors per dollar of claims. Since $0 < \phi < 1$, it is evident that ABS investors can not be made better off by recharacterization whenever $F_A \leq L_r^j$, since they would be paid in full if bankruptcy remoteness is preserved.

When $F_A > L_r^j$, the effect of recharacterization is not immediately obvious, since the ABS investors can turn to the firm's assets to cover the shortfall in the securitized assets. We can show, however, that even in this case, recharacterization will always hurt ABS investors. We summarize this proposition below:

Proposition 6 *If conditions (9) are necessary and sufficient for a recharacterization attempt by the firm, then ABS investors' recoveries will always be (weakly) higher when bankruptcy remoteness is preserved. The inequality is strict whenever $F_A > L_r^j$. As a result, an increase in π will increase credit spreads strictly for any security with non-zero risk of default.*

The key to the proposition is that recharacterization will only occur when the firm can transfer value from the ABS investors to the DIP lender, thus making a DIP loan possible

[40] We assume that the equity in the SPV is also held by an outside investor, which is consistent with our Proposition 1.

where it would not occur otherwise. Since this transfer results in inefficient overinvestment, both the ABS investors and firm value suffer in equilibrium.

6 Empirical Evidence

6.1 Motivation

In this section, we make use of the natural experiment provided by the LTV Steel bankruptcy to test Proposition 6, namely that an increase in recharacterization risk increases credit spreads for ABS investors. In addition, the LTV experiment provides a unique opportunity to determine whether the "bankruptcy remoteness" feature of securitization is quantitatively important enough to affect a firm's ex-ante financing decisions, as our model suggests. The special protection of ABS investors in bankruptcy is missing from most of the existing literature; this test enables us to establish its empirical importance.[41]

The judge's interim order in the LTV Steel case, which treated a securitization contract like a secured loan, may have influenced beliefs by market participants that future securitizations would be treated similarly. As described earlier, the LTV decision cast significant doubt on the ability to legally isolate assets and ensure the insulation of ABS from a Chapter 11 procedure. While the interim decision did not become a binding legal precedent (LTV and its ABS lenders reached an out-of-court settlement before a final binding decision was made), the case and its potential ramifications reverberated across the securitization market. The Dow Jones Newswires, for instance, stated:

> "The bankruptcy-remote vehicle structure, the backbone of the debt securitization market, is facing a major challenge from a judge's ruling in a bankruptcy filing by steel producer LTV Corp. ... market sources say the decision could jeopardize the underpinnings for securitized debt issues, which depend upon the assets earmarked for repayment being protected from bankruptcy proceedings."[42]

[41] Iacobucci and Winter (2005), to our knowledge, is the only work in addition to ours that makes a distinction between securitization and secured debt. These authors, however, express skepticism that bankrutpcy remoteness is important enough to affect financing decisions (p. 171), instead focusing on differential recourse to the firm's assets between the two instruments.

[42] Feldheim, David, 2001, "LTV ruling challenges legal basis for securitizations", Capital Market Report,

Our empirical strategy makes use of the fact that the implications of the LTV decision should have affected some ABS issuers more than others. Specifically, asset-backed securities originated by insured depository institutions should not have been affected by the LTV case. The insolvency procedure for insured banks is governed by the FDIC, making these originators ineligible for Chapter 11. More importantly, FDIC receivership rules include a provision (§360.6), in place when the LTV bankruptcy occurred, which explicitly guarantees that securitized assets can not be recharacterized.[43] No such provision exists in the U.S. bankruptcy code. For these reasons, ABS originated by insured depository institutions create an ideal control group to identify the value of bankruptcy remoteness to ABS investors.

To identify whether "bankruptcy remoteness" is priced into securitization contracts, we measure the difference-in-differences of ABS spreads over maturity-matched swap rates for depository and non-depository securitizers in the six month period before and after the LTV filing. Provided that any other changes in the ABS market pre- and post-LTV affected both depository and non-depository ABS, our difference-in-differences estimator is intended to capture the pure effect of the uncertainty created by the LTV bankruptcy on ABS spreads.

6.2 Data

We obtained data from SDC Platinum New Issues database on all public securitization transactions executed during the year centered around LTV bankruptcy filing. To focus attention on corporate securitizers, we exclude all securitized instruments issued by government sponsored enterprises (GSE) such as Federal Home Loan Mortgage Corporation (Freddie Mac) and Federal National Mortgage Association (Fannie Mae) Also excluded are firms that act as issuing intermediaries for other firms that do not tap the market directly. Most major investment banks maintain securitization conduits. However, as verified by consulting issuance

Dow Jones Newswires, February 16, 2001. See also Final, Colin, 2001, "Testing the waters of US ABS", Corporate Finance Magazine. We also examined several reports by major investment banks over the period, which expressed similar concerns as a result of LTV.

[43] Specifically, 360.6(b) states: "The FDIC shall not, by exercise of its authority to disaffirm or repudiate contracts under 12 U.S.C. 1821(e), reclaim, recover, or recharacterize as property of the institution or the receivership any financial assets transferred by an insured depository institution in connection with a securitization or participation, provided that such transfer meets all conditions for sale accounting treatment under generally accepted accounting principles, other than the "legal isolation" condition as it applies to institutions for which the FDIC may be appointed as conservator or receiver which is addressed by this section."

prospectuses, the assets backing the securities issued by these conduits were not originated by the investment banks but instead were purchased from many different firms and then pooled together. Thus, we do not observe the identity of the "true" originators in these cases. Finally, we restrict our sample to triple-A rated securities, for which sufficient data is available. The SDC database includes a small and incomplete sample of lower-rated ABS, since these tranches are more often privately placed; we exclude these to avoid potential sample selection issues.

We record the securities' yield-to-maturity at issuance, average life, issuance size and the identity of the originator. We consider ABS issued with fixed coupons.[44] To control for yield-to-maturity variations related to shifts in the term structure, we calculate the ABS spread over the swap rate with the closest maturity to the ABS average life using daily swap rates obtained from Datastream.[45]

To determine whether the originator is eligible for Chapter 11 or FDIC receivership, we examined the individual prospectuses for each issuance to determine the identity of the originator. In most cases, the prospectus explicitly identifies the potential risks to investors of either Chapter 11 or receivership, depending on the identity of the originator. Several of the prospectuses we examined in the post-LTV period explicitly mention the LTV case when discussing risks of originator bankruptcy; we present one such example in Appendix A. We also verified the status of the originator using a searchable directory of insured banks available on the FDIC's website.[46] Our final sample includes 585 issuances (tranches) where all data are available. Description of the data and summary statistics are provided in Table 4.

6.3 Results

To identify the effect of the LTV case on credit spreads, we regress ABS spreads on three dummy variables. The first dummy variable ("*Post-LTV*") equals one if the issuance occurs

[44] This approach is taken in several empirical corporate bond studies. See, for example, Eom, Helwege and Huang (2004).

[45] For a discussion why swap rates rather than Treasury rates are used as a benchmark by corporate issuers, see, for instance, Longstaff, Mithal and Neis (2005), and Collin-Dufresne and Solnik (2001).

[46] The website is http://www2.fdic.gov/idasp/main.asp

in the 6 month period after the LTV bankruptcy. The coefficient captures the average change in ABS spreads in the pre- and post-LTV periods due to macroeconomic or other influences. To the extent that such influences affect depository and non-depository securitizers equally, it should be picked up by this dummy. The second variable ("*Non-depository*") equals one if the originator is not an insured depository institution, thus making it eligible for Chapter 11. The coefficient on this variable captures differences in spreads between depository securitizers and non-depository securitizers, such as differential asset types, that are not due to the LTV effect. Of most interest to us is the dummy variable created by interacting the variables Post-LTV and Non-depository ("*Post-LTV*Non-depository*"). The coefficient captures the pure effect that the LTV bankruptcy had on spreads for Chapter 11-eligible securitizers. We report OLS regressions where the standard errors are corrected for potential clustering effects at the issuer level.[47]

Table 5 reports the results under various specifications. The coefficient on the interaction dummy is economically large (between 25 and 29 basis points) in all specifications and statistically significant in all but the most basic regression with no controls (column (1)). In columns 2 through 5 we include a series of control variables that we expect to affect ABS spreads. We expect that issuance size, which acts as a proxy for liquidity, should reduce spreads, while longer maturity should increase spreads (John, Lynch and Puri (2003) and Longstaff, Mithal and Neis (2005)). We control for these effects by including both linear and quadratic terms for issuance size and average life in columns (2) and (3), respectively. The coefficients on the control variables have the expected signs. Adding the control variables sharply decreases the standard error of the difference-in-differences coefficient but does not affect the magnitude greatly. In column (4) we add asset type dummies to control for variation in the type of assets being securitized, and in column (5) we replace asset type dummies with originator fixed effects.[48] The magnitude and statistical significance of the LTV effect is robust to each of these specifications.

In summary, our results show that following the LTV bankruptcy filing, non-depository securitizers, which are more likely to be sensitive to the ramifications of this case, experienced

[47] The issuer is the vehicle that issues ABS by a particular originator on a particular date.

[48] In this specification, we do not report the "non-depository" dummy, which is rendered redundant by the originator fixed effects.

a statistically and economically significant increase in their ABS issuance spreads relative to insured depository securitizers that were not Chapter 11 eligible. That result is consistent with our theoretical characterization of ABS, in that the avoidance of dilution in bankruptcy is valuable to creditors in a way that is observable in prices.

The empirical results also contribute to an understanding of a common justification for ABS. It is often argued that securitization allows firms to issue AAA rated securities "off the balance sheet", making it possible to borrow at a lower rate than they could "on the balance sheet". The fact that spreads increased sharply after LTV is an important indicator that bankruptcy treatment of securitization is a major explanatory factor for why these borrowing costs differ.

7 Discussion and Policy Implications

Having analyzed and compared the specific bankruptcy treatment of the financing instruments we consider in this paper, we can discuss the implications of our results for regulatory policy. We show in our model that when the underlying assets are replaceable, securitization can increase firm value by allocating cash flow and control rights in a way that cannot be replicated by other financing instruments. The distinction between ABS and secured debt, for example, depends crucially on complete separation of the securitized assets from the firm and their exclusion from the bankruptcy estate. As we noted above, such exclusion could be maintained only if a "true sale" is achieved and the bankruptcy court does not re-characterize the transaction as secured financing, resulting in the consolidation of the SPV's assets into the firm's bankruptcy estate. The data confirm that the protection to creditors afforded by ABS is indeed economically significant.

Addressing the concerns raised by the market in light of court decisions such as LTV, Congress considered adopting across-the-board "safe harbor" for structured finance transactions, by amending the federal bankruptcy code. The proposed amendment would have changed the definition of a bankruptcy estate to exclude all securitized assets, notwithstanding the fulfillment of state-level tests to determine the sale/secured loan characterization. Such "safe harbor" would also have prevented bankruptcy judges from re-characterizing a

structured finance transaction as secured debt. The proposed amendments were brought before the Congress in 2001 but were rescinded a year later following the revelation of fraud at Enron, much of which involved SPVs (see Schwarcz (2003)). The current legal situation is thus still unclear. ABS investors cannot rely upon clear-cut federal regulation guaranteeing their insulation from the originator's bankruptcy but rather have to navigate through a complicated and sometimes murky state regulation and case decisions.[49] The prospects of securitized assets being forced to be a part of a bankruptcy estate, thus effectively losing the efficiencies we have identified, are therefore not trivial.

One of the common objections expressed towards securitization is that it might hurt the firm's existing creditors. It has been argued in several papers that securitization essentially allows the firm to "judgment-proof" itself by removing assets from the supervision of the bankruptcy court thereby leaving fewer assets for the existing creditors.[50] While it should be emphasized that securitization merely replaces one asset with another and does not by itself depletes the assets available for the existing creditors, it has been suggested that securitization might be the most efficient tool to transfer assets between claimholders. A firm might securitize some of its assets and distribute the cash proceeds to its shareholders (or invest in negative-NPV projects) at the expense of unsuspecting creditors.

In our model, rational creditors anticipate these effects when their claims are initially priced. If securitization might adversely affect unsecured debt, creditors would demand a higher compensation for their investment such that the lower financing costs of securitization would be completely offset by the higher financing costs of the unsecured debt.[51] Unsecured creditors can also protect themselves with covenants (similar to prohibitions on asset sales and negative pledge clauses) if they are concerned about being diluted by securitization at a later point in time. While this classic Modigliani and Miller (1958) logic helps achieve

[49] It should be noted that several prominent states such as Delaware and Texas, have recently adopted state-level 'safe harbors' for securitization transactions. Such safe harbors will be effective as long as federal regulation will not supersede them. See Kaye Scholer LLP, 2002, "Will New Delaware Law Facilitate Securitization?"

[50] Such argument was chiefly used by the opponents to the proposed federal safe harbor. See a letter dated January 23, 2002, sent by 35 law professors to the Congress committees which contemplated the revisions to the bankruptcy code. See also LoPucki (1996) and Lupica (1998).

[51] This argument is of course not unique to securitization; Schwartz (1981) makes a similar argument with respect to secured debt.

an understanding about why securitization is not purely expropriation, it leaves open the question of whether this new financing tool can potentially affect firm value. In our model, securitization can create value because we assume contracts are incomplete in two ways. First, borrowers and lenders cannot write a complete contract that perfectly identifies the states in which a firm is optimally liquidated/continued ex-ante, and contracts are costly to renegotiate in bankruptcy. Second, while bankruptcy law can assist in the renegotiation process (in our model, by preventing secured creditors from holding up the firm and adjusting their claims to the liquidation value of the assets), the code has an inherent bias toward continuation (in allowing for secured creditors to be diluted by DIP lenders). When it is efficient to do so, securitization can create value by "contracting around bankruptcy" when maximal protection of lenders is warranted to prevent inefficient continuation. It is worth noting that this efficiency gain may actually benefit unsecured creditors ex-post, since they are less likely to be diluted by a DIP lender in bankruptcy.

Securitization can therefore be viewed as another form of private contracting innovation market participants use to minimize the costs imposed by a formal, court-supervised, bankruptcy procedure. While such procedure is believed to be necessary to deal with market inefficiencies precluding efficient recontracting of distressed firms, it introduces various costs borne by market participants. Similar to the way pre-packaged bankruptcy filings and out-of-court restructuring are used to minimize the costs imposed by Chapter 11, securitization emerges as another private contracting innovation aimed to enhance the efficiency of financial distress resolution mechanism when Chapter 11 is not the ideal avenue to pursue.

8 Conclusion

Absent an explicit description of the rights different types of contracts are afforded under bankruptcy law, it is difficult to distinguish between various "debt-like" instruments the firm may use in its capital structure, all of which have priority over equity and acquire additional control rights in the event of default. In this paper, we focus primarily on a recent financial innovation known as asset-backed securities, and compare it to the space of previously-existing financial contracts based on their treatment in bankruptcy. While

our model is not intended to supplant existing theories of capital structure, we believe it complements existing theories by considering a richer body of contracts that is difficult to distinguish without an understanding of bankruptcy law and the incentives it creates. Our empirical analysis surrounding the LTV case demonstrates that the bankruptcy treatment of ABS is indeed of first-order importance in the pricing of these contracts: the significant change in ABS spreads following the LTV bankruptcy confirms that bankruptcy remoteness provides creditor protection that is not available with secured debt, and this protection is valued by lenders.

Based on the contractual features of several "bankruptcy-relevant" contracts (ABS, unsecured and secured debt, and leases), our model explicitly accounts for the differential control rights and cash flow rights various classes of lenders receive at bankruptcy. These capital structure choices matter because they affect the eventual use of the assets when a firm goes bankrupt. We model the inefficiencies commonly associated with the bankruptcy process, namely that inefficient liquidations and inefficient continuations may occur; the optimal capital structure will be chosen in equilibrium to minimize the expected efficiency losses from these outcomes.

Two relevant features of Chapter 11, senior DIP financing and the time-value dilution of secured creditors, lead to an inherent bias toward continuation when unsecured and secured debt are the only instruments available and renegotiation is imperfect outside of bankruptcy. Securitization steps in to fill this void. Since securitization involves a "true sale" of the underlying assets, thus isolating them from the bankruptcy estate, ABS investors can achieve a level of seniority that is not guaranteed for secured or unsecured creditors in Chapter 11. This, in turn, helps alleviate the inefficient continuation problem. The value provided by ABS, however, depends heavily on the nature of assets being securitized. When the backing assets are replaceable, our model predicts that ABS is the most efficient financial instrument. When the securitized assets are necessary for reorganization, however, and the firm cannot easily replace them by resorting to outside markets, securitization can lead to inefficient holdups, and existing instruments such as secured debt and leases are likely to be more efficient.

While we focus the discussion and the model on U.S. bankruptcy law, our model may

also be of particular relevance for explaining cross-country patterns in securitization given the obvious interactions between security design and bankruptcy codes. As been argued in previous literature, countries differ in their bankruptcy regimes and in particular in the extent inefficient continuations are likely to occur. For instance, Acharya et al. (2004) argues that since the U.S. has debtor-friendly bankruptcy regime and the U.K. has a creditor-friendly regime, the former is more likely to be characterized with inefficient continuations whereas the latter with inefficient liquidations. Since securitization can minimize continuations in bankruptcy it may be especially valuable for firms operating in bankruptcy regimes subject to excess continuations. Extension of our model to incorporate the differences in bankruptcy regimes across countries seems a promising future research avenue.

References

[1] Adler, Barry E., 2005, "A Simple Game-Theoretic Solution to the Tension Between Cramdown and Holdup in Corporate Reorganization" working paper, New York University Law School.

[2] Ayer, John D., Michael Bernstein, and Jonathan Friedland, 2003, What every secured creditor (and its lawyer) should know about Chapter 11, *American Bankruptcy Institute Law Journal.*

[3] Ayotte, Kenneth M., and David A. Skeel, Jr., 2004, Why do distressed companies choose Delaware? An empirical analysis of venue choice in bankruptcy, Working Paper.

[4] Ayotte, Kenneth and David A. Skeel, Jr., 2006, An Efficiency-Based Explanation for Current Corporate Reorganization Practice, *University of Chicago Law Review 73.*

[5] Baird, Douglas and Robert Rasmussen, 2003, The end of bankruptcy, *Stanford Law Review* 55.

[6] Bebchuk, Lucian and Jesse Fried, 2001, A New Approach to Valuing Secured Claims in Bankruptcy, *Harvard Law Review* 114, 2386.

[7] Berkovitch, Elazar, and E. Han Kim, 1990, Financial Contracting and Leverage-Induced Over- and Under-Investment Incentives, *Journal of Finance* 45, 765-794.

[8] Bolton, Patrick, and David S. Scharfstein, 1990, A theory of predation based on agency problems in financial contracting, *American Economic Review* 80, 93-106.

[9] Bolton, Patrick, and David S. Scharfstein, 1996, Optimal debt structure and the number of creditors, *Journal of Political Economy* 104, 1-25.

[10] Bradley, Michael., and Michael Rosenzweig, 1992. The untenable case for Chapter 11, *Yale Law Journal* 101, 1043–1095.

[11] Calomiris, Charles W. and Joseph R. Mason, 2004, Credit card securitization and regulatory arbitrage, *Journal of Financial Services Research* 26:1, 5-27.

[12] Carapeto, Maria, 2003, Does debtor-in-possession financing add value?, Working Paper, Cass Business School.

[13] Che, Yeon Koo and Alan Schwartz, 1999, Section 365, mandatory bankruptcy rules and inefficient continuance, *Journal of Law, Economics and Organization,* 15:2, 441-467.

[14] Cohn, Michael J., 1998, Asset securitization: How remote is bankruptcy remote, *Hofstra Law Rev.* 26, 929.

[15] Collin-Dufresne, Pierre, and Bruno Solnik, 2001, On the term structure of default premia in the swap and LIBOR markets, *Journal of Finance* 56, 1095-1115.

[16] Cook, Karen, and F. Jim Della Sala, 1998, The role of the trustee in asset-backed securitization, in Fabozzi, Frank J. (ed.), Issuer perspectives on securitization.

[17] Dahiya, Sandeep, Kose John, Manju Puri, and Gabriel Ramirez, 2003, Debtor-in-possession financing and bankruptcy resolution: Empirical evidence, *Journal of Financial Economics* 69, 259-280.

[18] Dawson, Petrina R., 1998, Ratings games with contingent transfer: a structured finance illusion, *Duke Journal of Comparative & International Law* 8, 381.

[19] Dechow, Patricia M., Linda A. Myers, and Catherine Shakespeare, 2004, Playing with assumptions to report a rosy future today: The role of corporate governance in the reporting of asset securitizations, Working Paper.

[20] Eisfeldt, Andrea and Adriano Rampini, 2005, "Leasing, Ability to Repossess, and Debt Capacity" working paper, Northwestern University.

[21] Ellis, Robert Dean, 1999, Securitization vehicles, fiduciary duties, and bondholders' rights, *Journal of Corporation Law* 24, 295.

[22] Eom, Young Ho, Jean Helwege, and Jing-Zhi Huang, 2004, Structural models of corporate bond pricing: an empirical analysis, *Review of Financial Studies* 17, 499 - 544.

[23] Franks, Julian R., Kjell G. Nyborg, and Walter N. Torous, 1996, A comparison of US, UK, and German insolvency codes, *Financial Management* 25, 86.

[24] Fulghieri, Paolo, 1993, "Loan Sales and Balance Sheet Assets" published in *Financial Markets Liberalization and the Role of Banks*, Cambridge University Press, V. Conti and R. Hamaui eds.

[25] Gale, Douglas, and Martin Hellwig, 1985, Incentive-compatible debt contracts: The one-period problem, *Review of Economic Studies* 52, 647-663.

[26] Gan, Yingjin and Chris Mayer, 2005, Incentives and securitization: the case of commercial mortgage-backed securities, Columbia Business School, working paper

[27] Gaon, Stav, 2004, Securitization and the wealth expropriation hypothesis: An empirical analysis, Columbia Business School, Working Paper.

[28] Gertner, Robert, and David Scharfstein, 1991, A Theory of workouts and the effects of reorganization law, *Journal of Finance* 46, 1189-1222.

[29] Grossman, Sanford J., and Oliver D. Hart, 1986, The costs and benefits of ownership: A theory of vertical and lateral integration, *Journal of Political Economy* 94, 691-719.

[30] Hart, Oliver and John Moore, 1994, A theory of debt based on the inalienability of human capital, *Quarterly Journal of Economics,* 109, 841-879.

[31] Hart, Oliver, 2000, Different approaches to bankruptcy, in *Governance, Equity and Global Markets, Proceedings of the Annual Bank Conference on Development Economics in Europe*, June 21-23, 1999.

[32] Hill, Clare A., 1996, Securitization: A Low Cost Sweetener for Lemons, *Washington University Law Quarterly,* 74:4.

[33] Iacobucci, Edward M. and Ralph A. Winter, 2005, Asset securitization and asymmetric information *Journal of Legal Studies*, 34: 161-206.

[34] John, Kose, Anthony W Lynch, and Manju Puri, 2003, Credit ratings, collateral, and loan characteristics: Implications for yield, *Journal of Business* 76, 371.

[35] Leland, Hayne E., and David H. Pyle, 1977, Informational asymmetries, financial structure, and financial intermediation, *Journal of Finance* 32, 371-387.

[36] Longstaff, Francis A., Sanjay Mithal, and Eric Neis, 2005, Corporate yield spreads: default risk or liquidity?, forthcoming, *Journal of Finance.*

[37] LoPucki, Lynn M, 1996, The death of liability, *Yale Law Journal* 106, 1.

[38] Lupica, Lois R, 1998, Asset securitization: The unsecured creditor's perspective, *Texas Law Review* 76, 595.

[39] Minton, Bernadette, Tim Opler, and Sonya Stanton, 1997, Asset Securitization among industrial firms, Working Paper, Ohio State University.

[40] Minton, Bernadette, Anthony B. Sanders and Philip E. Strahan, 2004, Securitization by banks and finance companies: efficient financial contracting or regulatory arbitrage? Working paper, Ohio State University.

[41] Modigliani, Franco, and Merton H. Miller, 1958, The cost of capital, corporation finance and the theory of investment, *American Economic Review* 48, 261-297.

[42] Myers, Stewart C., 1977, Determinants of corporate borrowing, *Journal of Financial Economics* 5, 147-175.

[43] Osborne, Martin J. and Ariel Rubinstein, 1990, Bargaining and markets, Elsevier Science & Technology.

[44] Pennacchi, George G., 1988, Loan sales and the cost of bank capital, *Journal of Finance* 43, 375-396.

[45] Riddiough, Timothy J., 1997, Optimal design and governance of asset-backed securities, *Journal of Financial Intermediation* 6, 121-152.

[46] Rubinstein, Ariel, 1985, A Bargaining Model with Incomplete Information About Time Preferences, *Econometrica* 53:5, 1151-1172.

[47] Schwarcz, Steven L., 2003, Securitization post-Enron, *Cardozo Law Review* 25.

[48] Schwartz, Alan, 1981, Security interests and bankruptcy priorities: a review of current theories, *Journal of Legal Studies* 10.

[49] Smith, Clifford W., Jr., and L. MacDonald Wakeman, 1985, Determinants of corporate leasing policy, *Journal of Finance* 40, 895-908.

[50] Townsend, Robert M., 1979, Optimal contracts and competitive markets with costly state verification, *Journal of Economic Theory* 20, 265–293.

[51] Triantis, George G., 1993, A theory of the regulation of debtor-in-possession financing, *Vanderbilt Law Review*, 46, 901-934.

[52] Weber, Paul E. and R. Kenneth MacCallum, 1993, Rating agencies offer response to 'Octagon', *New York Law Journal*, October 12, 1993.

[53] White, Michelle J., 1989, The corporate bankruptcy decision, *Journal of Economic Perspectives* 3, 129-151.

A Prospectus of PSNH Holdings

Excerpt from prospectus of PSNH Holdings, April 23, 2001:

BANKRUPTCY AND CREDITORS' RIGHTS ISSUES

BANKRUPTCY OF THE SELLER COULD DELAY OR REDUCE PAYMENTS ON BONDS AND ADVERSELY AFFECT THE ABILITY TO RESELL RRB PROPERTY

If the seller were to become a debtor in a bankruptcy case, and a creditor or bankruptcy trustee of the seller or the seller itself as debtor in possession were to take the position that the RRB property constituted property of the seller's bankruptcy estate, and a court were to adopt this position, or a court were to order that the assets and liabilities of the issuer be substantively consolidated with those of the seller, then delays or reductions in payments on the bonds could result. For example, a creditor or bankruptcy trustee of the seller or the seller itself as debtor in possession might argue that the sale of the RRB property to the issuer was a loan to the seller from the issuer, secured by a pledge of the RRB property. Regardless of the court's determination of the proper characterization of the transaction in a seller bankruptcy case, the mere fact of a seller bankruptcy case could have an adverse effect on the resale market for the bonds and the market value of the bonds.

[...]

Some of the risks described in this section have been illustrated in the bankruptcy cases of LTV Steel Company and certain affiliates, or LTV. Upon the debtors' motion for interim authority to use cash collateral, the bankruptcy judge allowed the debtors to use receivables (and the related cash proceeds) that had been transferred to LTV's special purpose finance subsidiary prior to the commencement of the bankruptcy case and pledged by the subsidiary to a third party. As adequate protection for the transferred receivables, the court granted the pledgee a first priority unsecured claim against LTV and a security interest in receivables generated after commencement of the case. In a preliminary ruling denying the pledgee relief from the order, the court observed that the ultimate issue of whether LTV actually sold the receivables to the special purpose finance subsidiary was a fact-intensive issue that could not be resolved without extensive discovery and an evidentiary hearing. The dispute was then settled in conjunction with the approval of senior secured financing that would retire the debt securities issued by the special purpose finance subsidiary.

B Proofs of Propositions and Lemmas

Proposition 1 *When the firm has no necessary assets, it is optimal to securitize all assets-in-place (i.e. the value of securitized assets equal L_r^j), and bankruptcy outcomes are always ex-post efficient.*

Proof. When the replaceable assets, which will be worth L_r^j in bankruptcy, are sold to the SPV, the participation condition for the DIP investor is $p_2X_2^h + (1-p_2)X_2^l \geq K$. Since this is identical to the efficiency condition when $L_n = 0$, continuation will occur if and only if it is efficient. ■

Proposition 2 *If the firm securitizes necessary assets, there exist $p_2 \in [p_2^l, p_2^h]$ such that $p_2X_2^h + (1-p_2)X_2^l - K - L_n^j > 0$ and $p_2X_2^h + (1-p_2)X_2^l - K - M^{j*} < 0$; the firm liquidates despite continuation being efficient.*

Proof. The continuation condition is given by

$p_2X_2^h + (1-p_2)X_2^l - K - M^{j*} > 0$ where $M^{j*} = \frac{1}{2}L_n^j + \frac{1}{2}(p_2^hX_2^h + (1-p_2^h)X_2^l - K)$.

Given our assumption that $p_2^hX_2^h + (1-p_2^h)X_2^l - K - L_n^j > 0$, it is evident from inspection of M^{j*} that it can be rewritten as

$M^{j*} = L_n^j + \varepsilon$ where $\varepsilon > 0$. Then the continuation condition can be rewritten as

$p_2X_2^h + (1-p_2)X_2^l - K - L_n^j - \varepsilon \geq 0$

and the efficiency condition is given by

$p_2X_2^h + (1-p_2)X_2^l - K - L_n^j \geq 0$

thus, liquidation will occur despite continuation being efficient whenever $p_2X_2^h + (1-p_2)X_2^l - K - L_n \geq 0 > p_2X_2^h + (1-p_2)X_2^l - K - L_n^j - \varepsilon$

or equivalently, $p_2 \in [\frac{K+L_n^j-X_2^l}{X_2^h-X_2^l}, \frac{K+L_n^j-X_2^l+\varepsilon}{X_2^h-X_2^l}]$ which is non-empty since $\varepsilon > 0$, and $p_2^h > \frac{K+L_n^j-X_2^l}{X_2^h-X_2^l} > p_2^l$ by assumption. ■

Lemma 3 *The optimal lease policy sets the lease payment on the necessary assets, F_n^L, equal to the expected liquidation value $E(L_n)$. The lease payment on the replaceable assets, F_r^L, is set such that the lease is always rejected; i.e. the optimal F_r^L is any value such that $F_r^L \geq L_r^h$.*

Proof. We start by solving for the efficiency loss from using leases to find the optimal F_n^L. A simplified representation of the efficiency loss is given by the expression below (this assumes that $L_r^h - F_r^L < F_n^L - L_n^l$, which will be true in equilibrium):

$$(1-\gamma)(1-\lambda)\int_{\frac{K+L_n^l-X_2^l}{X_2^h-X_2^l}}^{\frac{K+F_n^L-X_2^l}{X_2^h-X_2^l}}\{p_2X_2^h+(1-p_2)X_2^l-K-L_n^l\}f(p_2)dp_2+ \tag{10}$$

$$(1-\gamma)\lambda\int_{\frac{K+F_n^L-X_2^l}{X_2^h-X_2^l}}^{\frac{K+L_n^h-X_2^l}{X_2^h-X_2^l}}\{L_n^h-(p_2X_2^h+(1-p_2)X_2^l-K)\}f(p_2)dp_2$$

$$\gamma(1-\lambda)\int_{\frac{K+L_n^l-X_2^l}{X_2^h-X_2^l}}^{\frac{K+F_n^L-X_2^l-\left(L_r^h-F_r^L\right)}{X_2^h-X_2^l}}\{p_2X_2^h+(1-p_2)X_2^l-K-L_n^l\}f(p_2)dp_2+$$

$$\gamma\lambda\int_{\frac{K+F_n^L-X_2^l-\left(L_r^h-F_r^L\right)}{X_2^h-X_2^l}}^{\frac{K+L_n^h-X_2^l}{X_2^h-X_2^l}}\{L_n^h-(p_2X_2^h+(1-p_2)X_2^l-K)\}f(p_2)dp_2$$

We choose F_n^L, F_r^L to minimize the above expression. We solve first for F_n^L given F_r^L. Applying the Leibniz rule, the first-order condition reduces to:

$\frac{(1-\gamma)(1-\lambda)}{X_2^h-X_2^l}\left[F_n^L-L_n^l\right]+\frac{(1-\gamma)\lambda}{X_2^h-X_2^l}\left[F_n^L-L_n^h\right]$

$+\frac{\gamma(1-\lambda)}{X_2^h-X_2^l}\left[F_n^L-\left(L_r^h-F_r^L\right)-L_n^l\right]$

$+\frac{\gamma\lambda}{X_2^h-X_2^l}\left[F_n^L-\left(L_r^h-F_r^L\right)-L_n^h\right]=0$

solving that we obtain

$F_n^L-E(L_n)-\gamma(L_r^h-F_r^L)=0$

And the lease contract for the necessary assets is

$F_n^{L*}=E(L_n)+\gamma(L_r^h-F_r^L)$

Now solve for optimal F_r^L given F_n^{L*}:

the first-order condition is given by:

$\frac{(1-\gamma)(1-\lambda)}{X_2^h-X_2^l}\left[F_n^{L*}-L_n^l\right]+\frac{(1-\gamma)\lambda}{X_2^h-X_2^l}\left[F_n^{L*}-L_n^h\right]+\frac{\gamma(1-\lambda)}{X_2^h-X_2^l}\left[F_n^{L*}-\left(L_r^h-F_r^L\right)-L_n^l\right]$

$+\frac{\gamma\lambda}{X_2^h-X_2^l}\left[F_n^{L*}-\left(L_r^h-F_r^L\right)-L_n^h\right]=0$

The expression reduces to

$\gamma(L_r^h-F_r^L)$ which is clearly minimized by setting $F_r^L=L_r^h$. Since the lease will never be accepted for $F_r^L>L_r^h$, any lease payment such that $F_r^L\geq L_r^h$ is equivalent. ■

Proposition 4 *For the given parameter values, the following capital structures are optimal:*

a) When $L_n^j = 0$, $\lambda = 1$, *the optimal capital structure is to securitize all existing assets.*

b) As $\delta \to 0$, *the optimal capital structure is to securitize all replaceable assets and issue secured debt backed by the necessary assets, with face value of at least* L_n^h*;*

c) As $Var(L_n) \to 0$, *the optimal capital structure is to securitize all replaceable assets and lease necessary assets with an option to assume the lease at a price* $E(L_n)$.

Proof. Part a) of the proposition follows immediately from Proposition 1.

Part b) The efficiency loss from inefficient investment decisions under this capital structure is given by:

$$\lambda \int_{\frac{K+\delta L_n^h - X_l^2}{X_2^h - X_2^l}}^{\frac{K+L_n^h - X_2^l}{X_2^h - X_2^l}} \{L_n^h - (p_2 X_2^h + (1-p_2)X_2^l - K)\} f(p)dp$$

$$+ (1-\lambda) \int_{\frac{K+\delta L_n^l - X_2^l}{X_2^h - X_2^l}}^{\frac{K+L_n^l - X_2^l}{X_2^h - X_2^l}} \{L_n^l - (p_2 X_2^h + (1-p_2)X_2^l - K)\} f(p)dp$$

Integrating and simplifying yields the efficiency loss for secured debt:

$Loss(Secured) = \frac{\delta^2 [E(L_n)]^2}{2(X_2^h - X_2^l)(p_2^h - p_2^l)}$

Integrating and simplifying (10), using the optimal leasing policy from the proof of Lemma 3 above gives

$Loss(lease) = \lambda(1-\lambda)\left[\frac{(L_n^h - L_n^l)^2}{2(p_2^h - p_2^l)(X_2^h - X_2^l)}\right] = \frac{1}{2(X_2^h - X_2^l)(p_2^h - p_2^l)} Var(L_n)$

To prove part (b) of the proposition, note first that the efficiency of loss goes to zero as $\delta \to 0$. If $Var(L_n)$ is bounded away from zero, leasing or securitizing the necessary assets will necessarily lead to an efficiency loss strictly greater than zero. To see this, suppose first that the necessary assets are leased with an exercise price of F_n^L. Then the efficiency loss will approach zero if and only if the replaceable assets are financed with a state-contingent lease with exercise price arbitrarily close to $L_r^j - (F_n^L - L_n^j)$ for each possible realization of the liquidation values. By assumption, this is not feasible since the liquidation values are non-contractible. Similarly, if the firm securitizes the necessary assets, a state-contingent lease on the replaceable assets with exercise price $L_r^j - (M^{j*} - L_n^j)$ would be required which is similarly not feasible.

Given that the necessary assets are financed with secured debt, the optimal (infeasible) contract on the replaceable assets is one that requires the firm to buy the replaceable assets at a price above its liquidation value, $L_r^j + (1-\delta)L_n^j$. This will never occur in equilibrium since the firm can always borrow in a competitive capital market. Given this, the firm

can do no better than securitizing the replaceable assets, which forces it to pay the highest feasible price L_r^j.

To prove part (c), note from the expression $Loss(lease)$ above that the efficiency loss goes to zero as $Var(L_n) \to 0$. Using similar arguments as in part (b), it is straightforward to verify that the necessary assets are optimally financed with leases if δ is bounded away from zero. Given that this is true, Lemma 3 shows that the optimal treatment of the replaceable assets is to set the exercise price at any level greater than or equal to L_r^h. This is equivalent to securitization. It remains only to show that the replaceable assets should not be financed with secured debt. Similar to the argument in part (b), conditional on financing the replaceable assets with secured debt, efficiency loss would approach zero if and only if the lease on the necessary assets were state-contingent with a exercise price equal to $E(L_n) + (1-\delta)L_r^j$. ■

Proposition 5 *An increase in recharacterization risk (π) increases the probability of an inefficient continuation, and hence reduces firm and equity values..*

Proof. The only difference between the efficiency loss when $\pi = 0$ (see proposition 4)

and the case when $\pi > 0$ occurs when a recharacterization is successful. In this scenario, the firm is reorganized when it would otherwise be liquidated. A necessary condition for recharacterization to occur is that $p_2 X_2^h + (1-p_2)X_2^l - (1-\delta)L_n^j - K < 0$, which implies that $p_2 X_2^h + (1-p_2)X_2^l - L_n^j - K < 0$ since $\delta > 0$. But this implies that continuation is inefficient whenever recharacterization occurs, which implies that an increased risk of recharacterization increases efficiency losses through inefficient continuations.

The second part of the result follows directly, since ex-ante firm value (and equity value, which is firm value less I_0) is decreasing in the expected losses from inefficient bankruptcy outcomes, which we have shown are increasing in π. ■

Proposition 6 *If the recharacterization conditions are necessary and sufficient for a recharacterization attempt by the firm, then ABS investors' recoveries will always be (weakly) higher when bankruptcy remoteness is preserved. The inequality is strict whenever $F_A > L_r^j$. As a result, an increase in π will increase credit spreads strictly for any security with non-zero risk of default.*

Proof. There are two cases to consider. When $F_A \leq L_r^j$, then ABS investors would receive F_A if no recharacterization occurs. Clearly they can not receive more than this, so bankruptcy remoteness is always (at least weakly) preferred. We will show that recharacterization makes ABS investors strictly worse off whenever $F_A > L_r^j$.

Following the discussion in the text, the recharacterized secured creditor's claim is bifurcated into a secured and an unsecured piece. The secured portion of their claim is worth $(1-\delta)L_r^j$ in expectation.

To value the unsecured portion of the claim, note that the unsecured creditors as a whole (recharacterized securitization creditors and other unsecured creditors) receive any surplus from the firm after the senior securities are paid. Since the DIP lender is competitive by assumption, the unsecured creditor recovery is identical to the condition required for the DIP lender to invest. Under a recharacterization, unsecured creditors as a whole recover the following in expectation: $p_2X_2^h + (1-p_2)X_2^l - (1-\delta)(L_n^j + L_r^j) - (K - L_r^j)$

So the maximum possible recovery for ABS investors under recharacterization is the sum of the secured and unsecured pieces:

$p_2X_2^h + (1-p_2)X_2^l - (1-\delta)L_n^j - (K - L_r^j)$

If $F_A > L_r^j$, then ABS investors would receive L_r^j, so they are better off as secured creditors only if the difference between the two payoffs, $p_2X_2^h + (1-p_2)X_2^l - (1-\delta)L_n^j - (K - L_r^j) - L_r^j = p_2X_2^h + (1-p_2)X_2^l - (1-\delta)L_n^j - K$, is positive. But this violates the condition under which the firm attempts recharacterization; hence, ABS investors are always worse off under recharacterization.

To prove the second part of the proposition, suppose the firm promises the ABS investor a claim on the SPV with face value F_A such that $L_r^l < F_A \leq L_r^h$ with $\gamma < 1$ (implying that the ABS are not default-free). Due to our assumption that lending markets are competitive, the price of the security P_A will satisfy the following condition:

$$\begin{aligned} P_A = \gamma(p_1 + (1-p_1)(1-\pi q_h))F_A + \\ (1-\gamma)(p_1 + (1-p_1)(1-\pi q_l))L_r^l + \\ \gamma(1-p_1)\pi q_h R(F_A, L_r^h) + \\ (1-\gamma)(1-p_1)\pi q_l R(F_A, L_r^l)) \end{aligned}$$

where q_h, q_l are the probabilities that the firm attempts recharacterization conditional on bankruptcy as a function of the liquidation value of the replaceable assets, π is the probability of recharacterization by the bankruptcy judge conditional on a recharacterization attempt, and $R(F_A, L_r^h)$ and $R(F_A, L_r^l)$ are the ABS investor payoffs when recharacterization occurs as a function of the liquidation values and the face value of the ABS claim. The first part of the proposition establishes that the RHS of the equation is strictly decreasing in π, since $R(F_A, L_r^h) \leq F_A$ and $R(F_A, L_r^l) < L_r^l$ whenever a recharacterization attempt occurs. This implies that P_A is strictly decreasing in π, and since the interest rate of the ABS security is

$r_A = \frac{F_A}{P_A} - 1$, this implies that r_A is increasing in π. ■

Figure 1: Model Time-line

T = 0

- Wealthless owner-manger seeks I_0 to finance a project using one (or more) of the following instruments:
  - Unsecured debt
  - Secured debt
  - Lease
  - ABS

T = 1

- Repayment to investors is due.
- The project yields X_1^h or *0* with prob. p_1 and $1\text{-}p_1$, respectively.
- X_1^h: Debt is paid off. Game ends.
- *0*: Firm defaults. Bankruptcy protection.
  - *$K* and any necessary assets are required for continuation.
  - Continuation occurs if DIP financing is obtained to meet the required investment for continuation. Liquidation otherwise.
  - Liquidation value *L* is composed of two components: replaceable assets (L_r) and necessary assets (L_n)

T = 2

- Conditional on continuation, the payoff is X_2^h or X_2^l with prob. p_2 and $1\text{-}p_2$, respectively.
- DIP lender and other creditors are paid based on seniority under bankruptcy law.

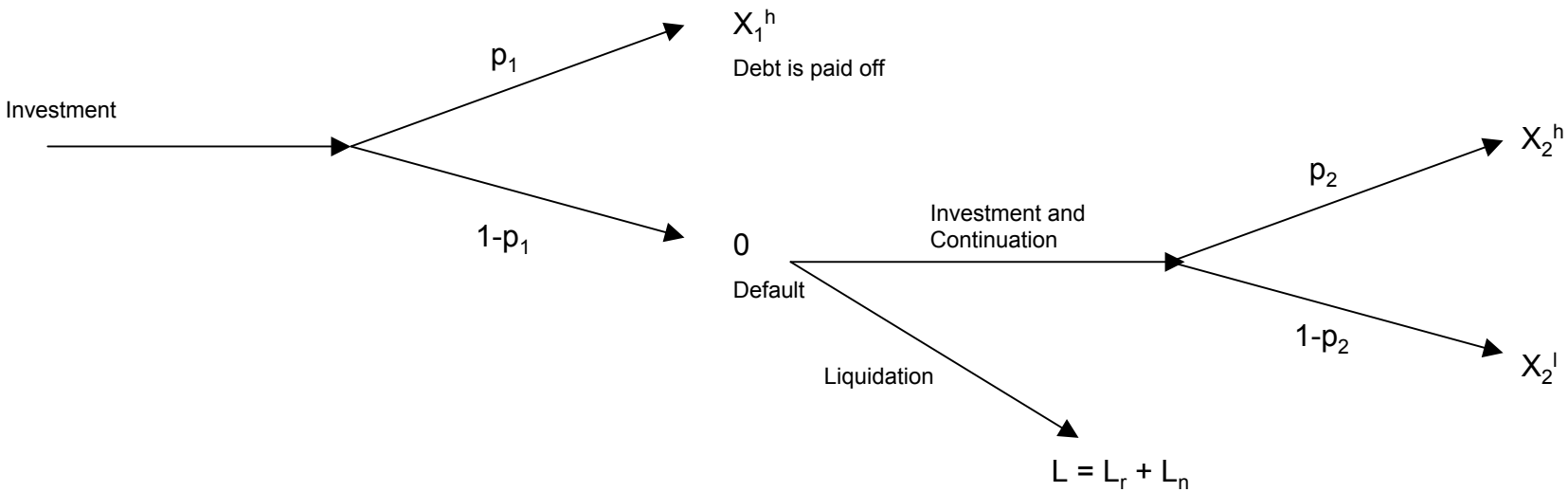

Table I: the table reports the number of publicly issued securitizion transactions executed by financial and non-financial firms in each year for the period 1990-2002. Financial Securitizers are those firms with first-digit SIC code equal to 6 and Non-financial Securitizers are all other firms. Mortgage-backed securities (MBS) transactions are excluded. To be included in this table, a securitization transaction must have been rated by at least one major rating agency, was under the control of a trustee and collateralized by assets of some kind. For a full description of the dataset, as well as additional selection criteria imposed, see Gaon (2004).

Year	Financial Securitizers	Non-financial Securitizers	Total Securitizers	Percentage of Non-financial Securitizers
1990	12	8	20	40.0%
1991	12	8	20	40.0%
1992	13	14	27	51.9%
1993	21	10	31	32.3%
1994	27	16	43	37.2%
1995	36	24	60	40.0%
1996	49	20	69	29.0%
1997	49	29	78	37.2%
1998	53	31	84	36.9%
1999	55	31	86	36.0%
2000	45	31	76	40.8%
2001	39	33	72	45.8%
2002	39	28	67	41.8%
Total	450	283	733	38.6%

Table II: the table reports the total public issuance volume (in $MM) of ABS for financial and non-financial securitizers in each year for the period 1990-2002. Financial securitizers are those firms with first-digit SIC code equal to 6 and Non-financial securitizers are all other firms. Mortgage-backed securities (MBS) transactions are excluded. To be included in this table, a securitization transaction must have been rated by at least one major rating agency, was under the control of a trustee and collateralized by assets of some kind. For a full description of the dataset, as well as additional selection criteria imposed, see Gaon (2004).

Year	Financial Firms Securitization	Non-financial Securitization	Total Securitization	Percentage of Non-financial Securitization
1990	21,068	14,600	35,667	40.9%
1991	21,232	18,452	39,684	46.5%
1992	16,966	27,383	44,350	61.7%
1993	24,223	24,656	48,878	50.4%
1994	43,168	20,540	63,708	32.2%
1995	68,364	29,256	97,620	30.0%
1996	96,039	32,086	128,125	25.0%
1997	118,345	32,610	150,955	21.6%
1998	128,599	47,908	176,507	27.1%
1999	115,809	67,434	183,243	36.8%
2000	115,336	79,473	194,808	40.8%
2001	141,099	91,835	232,933	39.4%
2002	177,476	98,871	276,347	35.8%
Total	1,087,723	585,102	1,672,825	35.0%

Table III: Number of securitizers and extent of securitization by industry: the table reports the number of different firms in each industry that executed a securitization transaction at least once during the period 1990-2002. The Annual Securitization columns report the annual mean, median and standard deviation of the securitization volume for firms that securitized during the sample period. The Ratio columns report the mean and standard deviation of the securitization volume to total assets ratio, conditional on securitization taking place in that year. Mortgage-backed securities (MBS) transactions are excluded. To be included in this table, a securitization transaction must have been rated by at least one major rating agency, was under the control of a trustee and collateralized by assets of some kind. For a full description of the dataset, as well as additional selection criteria imposed, see Gaon (2004).

				Annual Securitization ($MM)			Ratio of securitization to firm's assets	
SIC Code Major Groups (2-Digit)		Number of Securitizers	Percent of Total Securitizers	Mean	Median	Std. Deviation	Mean	Std. Dev.
15-17	Construction Industries	1	0.8%	547.9	0.0	771.3	0.10	0.14
20-39	Manufacturing	20	16.3%	1693.6	298.1	3917.0	0.11	0.24
41-49	Transportation, Communication, and Utilities	20	16.3%	190.1	0.0	622.4	0.02	0.05
50-51	Wholesale Trade	1	0.8%	293.4	0.0	502.3	0.05	0.09
52-59	Retail Trade	10	8.1%	348.6	0.0	756.5	0.04	0.09
60-67	Finance, Insurance, and Real Estate	65	52.8%	1287.2	145.0	2530.2	0.73	1.79
70-89	Service Industries	3	2.4%	766.0	0.0	2063.2	0.29	0.59
91-97	Public Administration	3	2.4%	236.5	0.0	352.5	0.03	0.06
Total		123	100%	1046.2	205.6	2523.8	0.37	1.26

Table IV: The table reports means of ABS issuance characteristics for depository and non-depository securitizers. Depository securitizers are those originators identified in the issuance prospectuses as not eligible for Chapter 11. The sample period is for the year centered around LTV Steel filing for bankruptcy protection on December 29, 2000. ABS Spread is spread over maturity-matched swap rates.

	ABS Spread (%)	Issuance Size ($MM)	Average Life	Number of Issuances	Number of Securitizers
Non-depository Securitizers					
pre-LTV	0.345	162.6	3.0	203	38
post-LTV	0.498	172.0	3.8	174	35
Depository Securitizers					
pre-LTV	0.838	93.9	6.0	131	16
post-LTV	0.724	63.0	6.6	77	9

Table V: The table reports OLS regression results for a difference-in-differences estimation, investigating the effect LTV Steel bankruptcy had on ABS issuance spreads of non-depository securitizers. Depository securitizers are those originators identified in the issuance prospectuses as not eligible for Chapter 11. The sample period spans the year centered around LTV bankruptcy filing on December 29, 2000. The dependent variable is ABS issuance spreads over maturity-matched swap rates, in percentage. *Post-LTV* is a dummy variable equal to 1 if the issuance occurred after the LTV bankruptcy. *Non-depository* is a dummy variable equal to 1 if the securitizer/originator is a non-depository firm. *Post-LTV*Non-depository* is a dummy created by interacting the variables Post-LTV and Non-depository. Issuance size and Average Life relate to a particular ABS issuance. Standard errors are adjusted for clustering effects at the issuer level.

	(1)	(2)	(3)	(4)	(5)
Post-LTV	-0.130	-0.184	-0.161	-0.142*	-0.147
	[0.295]	[0.121]	[0.101]	[0.084]	[0.094]
Non-depository	-0.505*	-0.207*	-0.156*	-0.106*	-
	[0.267]	[0.110]	[0.088]	[0.061]	-
Post-LTV*Non-depository	0.257	0.288**	0.274**	0.261***	0.271***
	[0.306]	[0.129]	[0.107]	[0.090]	[0.098]
Issuance Size ($MM)		-0.001***	-0.003***	-0.001**	-0.001***
		[0.000]	[0.000]	[0.000]	[0.000]
Average Life		0.074***	0.130***	0.093***	0.101***
		[0.011]	[0.015]	[0.011]	[0.012]
[Issuance Size ($MM)]^2			0.000***	0.000*	0.000***
			[0.000]	[0.000]	[0.000]
[Average Life]^2			-0.005***	-0.004***	-0.004***
			[0.001]	[0.001]	[0.001]
Constant	0.862***	0.524***	0.490***	0.131	0.357***
	[0.262]	[0.121]	[0.090]	[0.087]	[0.057]
Asset Type Dummies	No	No	No	Yes	No
Originator Dummies	No	No	No	No	Yes
Observations	585	585	585	585	585
Adjusted R-squared	0.17	0.66	0.73	0.82	0.85

Clustering-adjusted standard errors in brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%