Liquidation Values and Debt Capacity: A Market Equilibrium Approach

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ABSTRACT

We explore the determinants of liquidation values of assets, particularly focusing on the potential buyers of assets. When a firm in financial distress needs to sell assets, its industry peers are likely to be experiencing problems themselves, leading to asset sales at prices below value in best use. Such illiquidity makes assets cheap in bad times, and so ex ante is a significant private cost of leverage. We use this focus on asset buyers to explain variation in debt capacity across industries and over the business cycle, as well as the rise in U.S. corporate leverage in the 1980s.

HOW DO FIRMS CHOOSE debt levels, and why do firms or even whole industries sometimes change how much debt they have? Why, for example, have American firms increased their leverage in the 1980s (Bernanke and Campbell (1988), Warshawsky (1990)), and why has this debt increase been the greatest in some industries, such as food and timber? Despite substantial progress in research on leverage, these questions remain largely open. In this paper, we explore an approach to debt capacity based on the cost of asset sales. We argue that the focus on asset sales and liquidations helps clarify the cross-sectional determinants of leverage, as well as why debt increased in the 1980s.

Williamson (1988) stresses the link between debt capacity and the liquidation value of assets. He argues that assets which are redeployable—have alternative uses—also have high liquidation values. For example, commercial land can be used for many different purposes. Such assets are good candidates for debt finance because, if they are managed improperly, the manager will be unable to pay the debt, and then creditors will take the assets away from him and redeploy them. Williamson thus identifies one important determinant of liquidation value and debt capacity, namely, asset redeployability.[1]

[1] Harris and Raviv (1990), Hart and Moore (1989), Diamond (1991), and Hart (1991) present models in which liquidation value appears as an exogenously given factor in determining debt capacity. Only Harris and Raviv (1990) treat liquidation value as a central parameter of their model. Unlike Williamson (1988), none of these papers discuss the determinants of the liquidation value, which is the central focus of our work.

Unfortunately, most assets in the world are quite specialized and, therefore, are not redeployable. Oil rigs, brand name food products, pharmaceutical patents, and steel plants have no reasonable uses other than the one they are destined for. When such assets are sold, they have to be sold to someone who will use them in approximately the same way. Williamson does not address the problem of such sales. This paper analyzes what prices non-redeployable assets fetch in asset sales or liquidations relative to their value in best use. We call this difference between price and value in best use *asset illiquidity*. We argue that many assets are often illiquid, i.e., fetch prices below values in best use when liquidated, and that asset illiquidity has important implications for capital structure.

The principal reason for asset illiquidity—and the principal contribution of this paper—is the *general equilibrium* aspect of asset sales. When firms have trouble meeting debt payments and sell assets or are liquidated, the highest valuation potential buyers of these assets are likely to be other firms in the industry. But these firms are themselves likely to have trouble meeting their debt payments at the time assets are put up for sale as long as the shock that causes the seller's distress is industry- or economy-wide. When they themselves are hurting, these industry buyers are unlikely to be able to raise funds to buy the distressed firms' assets. Even if industry buyers can raise funds, in many cases antitrust and other government regulations might prevent them from purchasing the liquidated assets of competitors. Because of credit constraints and government regulation of industry buyers, assets would have to be sold to industry outsiders who don't know how to manage them well, face agency costs of hiring specialists to run these assets, and, moreover, fear overpaying because they cannot value the assets properly. When industry buyers cannot buy the assets and industry outsiders face significant costs of acquiring and managing the assets, assets in liquidation fetch prices below value in best use, which is the value when managed by specialists.

This result contrasts with the view expressed by many academic lawyers (e.g., Baird (1986)) that conducting an immediate auction is the best way to allocate the assets of distressed firms. The idea behind this claim is that auctions allocate the assets to the highest value user for the price equal to the second highest fundamental valuation. If the first and second highest valuations are reasonably close, then the auction price will be close to fundamental value in best user. In our model, in contrast, illiquid assets are not always allocated to the highest fundamental valuation users, and the auction price will not necessarily be close to the value in best use. This implies that forced liquidations can have significant private costs to the asset seller as well as significant social costs to the extent that the assets do not end up owned by the highest value user. Despite these costs, complete or partial liquidation will, in some cases, be the least costly of the various alternatives which include debt rescheduling and new equity issues. In other cases, the least costly strategy will be to continue operating under formal bankruptcy protection. We agree with Easterbrook (1990) that the policy of

automatic auctions for the assets of distressed firms, without the possibility of Chapter 11 protection, is not theoretically sound.

Our approach implies that liquidated assets are underpriced in recessions and therefore suggests that asset illiquidity is a potentially important cost of leverage. As a result, asset liquidity helps explain cross-sectional and time series financing patterns. Harris and Raviv (1991) exhaustively surveyed the theoretical literature on optimal capital structure and catalogued the relevant empirical work. While some studies have identified characteristics of individual assets that predict higher leverage, such as "tangibility" and R & D intensity, none have focused on the "general equilibrium" (industry, legal, and macroeconomic) factors that determine which assets are liquid and therefore have a higher debt capacity. Perhaps more importantly, no other work has explained major shifts in borrowing behavior over short periods of time, such as those that occurred in the United States in the 1980s.

The first section of the paper explains the effects we have in mind, using an example of a bankrupt farmer. Section II presents a formal model, which builds on Stulz (1990) and Hart (1991). Section III discusses some extensions of the basic model. Section IV looks at the implications of the analysis for cross-sectional financing patterns, Section V presents the time series implications, and Section VI focuses on the specific case of the takeover wave and leverage increase in the 1980s. Section VII presents our conclusions.

I. Determinants of Asset Liquidity: An Example

To fix ideas, consider a heavily indebted farmer whose farm is not currently generating a sufficient cash flow to cover his interest payments. Suppose that this farmer cannot reschedule his debt, issue new equity, or borrow more. He might not be able to reschedule the debt because his banker is not sure that he is really competent, and would like to foreclose and auction off the property rather than wait. He might be unable to issue new securities because of debt overhang, studied by Myers (1977), Hart and Moore (1989), and Hart (1991), and also used in the model below. Or it might be a consequence of adverse selection problems facing the potential buyers of securities, as suggested by Myers and Majluf (1984). When the farmer cannot keep the creditors away by raising more cash, the farm is liquidated.

There are three distinct types of potential buyers of the land. It can be sold to an outsider who would convert it to "alternative" use, such as a baseball field. It could be sold to a neighbor who would farm it himself. Or it could be sold to a financial "deep pocket" investor who would hire the current or some other farmer to farm the land, at least until he could resell it. This list of buyer types pretty much exhausts the relevant set for most assets.

Suppose that the asset, namely farmland, is converted to another use, such as the baseball field. If the land is as valuable as a baseball field as it is as a farm, this solution is very attractive in that the farmer gets a price close to the value in best use, especially if there are several bidders. Such land would be fungible, or "redeployable" in Williamson's (1988) language, and as such

would be very liquid. But of course farms and other assets virtually never have alternative uses as good as the current use. The buyer in liquidation would most likely have to use the land for farming.

The most likely high valuation buyer is one of the neighboring farmers. These buyers have the enormous advantage of knowing the quality of the land and perhaps even the quality of the current farmer. The adverse selection problems that might plague outsiders interested in the farm are much less important for the neighbors. Moreover, the neighbors can work the land themselves, thereby avoiding the agency problems resulting from hiring employees. In fact if the neighbors are actually allowed to bid for the farm and if they can borrow at attractive terms, they are likely to buy the farm. Competition among neighbors would ensure a price close to value in best use, making the land liquid.

Unfortunately, in many cases, the neighbors might not be able to bid or able to borrow at attractive terms. First, neighbors might be legally excluded from bidding because of government limits on farm size (this is obviously more relevant in the case of antitrust restrictions on companies). In addition, unless the farmer got in trouble for some *idiosyncratic* reason such as mismanagement, the neighbors are likely to have cash flow problems of their own at the time the farmer is distressed. They might therefore simply be unable to borrow to buy the farm, as our model below illustrates. When the neighbors cannot participate, or when they face credit constraints, the land has be sold to a "deep pocket" industry outsider, who by definition does not face as severe a credit constraint as the farmer's neighbors.

This outsider, however, faces his own set of extra costs of buying the farm. He must worry about the quality of the farm, which he knows little about, and so is afraid to overpay. In addition, he cannot run the farm himself, and so must hire either the current farmer or someone else to run it. The agency cost further reduces the value to him relative to the value to the neighbors. Because of these adverse selection and moral hazard problems, the price that a deep pocket outsider will pay for the farm will be lower than the neighbors would pay if they were not constrained. As a result, the land will sell at a low price to the inefficient operator: a case of illiquidity.

The moral of the story is that the general equilibrium problem—namely, that the highest valuation buyers are likely not to be able to bid for the land —will lead to the sale of land to inefficient managers at prices below value in best use. The prospect of ex post losses of this type generates an ex ante incentive to adjust leverage to mitigate the possibility of forced asset sales at prices below value in best use.

II. The Model

A. Overview

Our model is closely related to the work of Jensen (1986), Hart and Moore (1989, 1990), Harris and Raviv (1990), Stulz (1990), and Diamond (1991). The

actual formulation builds on Hart (1991).[2] To describe the model simply, suppose we have an industry with two firms, and there are two future states of the world: prosperity and depression. In prosperity, each firm has a *negative* NPV investment project that its managers would like to undertake for their own personal benefit. Investors would like to keep firms from undertaking these projects. To do that, investors create a *debt overhang* using senior long-term debt as well as short-term debt. The short-term debt forces the firm to come to the capital market when it wants to invest, even if its cash flow is high. Long-term debt, in contrast, ensures that the firm cannot borrow in prosperity when it wants to invest because of the debt overhang. Hart thus extends the insight of Myers (1977) to show that long-term debt can be used to prevent firms from borrowing.

Although this combination of long- and short-term debt keeps both firms from investing in prosperity, it has a cost in the recession. Suppose that one firm is hit harder by the recession and so cannot afford to pay its short-term debt. Because of the long-term debt overhang, it cannot borrow to continue its operations. Moreover, assume that the debt cannot be rescheduled and that the firm is forced into liquidation.[3] Suppose that the best buyer is the other firm in the industry. But remember that the second firm itself has both short- and long-term debt, and so is most probably unable to borrow to acquire the first firm. The debt that keeps the second firm from investing in prosperity also keeps it from buying the assets of the liquidating firm in the recession. In the extreme, the second firm might be near or in liquidation itself! When the second firm cannot buy the assets of the liquidated firm, they get sold to someone outside the industry who might be an inferior operator but does not have the debt overhang. In the depression then, assets are sold to an inferior operator because the better users (other firms in the industry) are constrained in the capital market. The model thus delivers our result that optimal capital structures can lead to costly liquidation in some states of the world because all the best users of the assets are credit constrained at the same time.

B. Details of the Model

The model has three periods, 0, 1, and 2. There are two firms in the industry. The capital structure is determined in period 0; uncertainty is resolved in period 1, when firms have to make further decisions as well as receive and pay out some cash flow; and finally in period 2 additional cash flows are received. There are two states of the world, prosperity and depression, and uncertainty about the state is resolved in period 1. In prosperity, each firm gets a negative NPV investment opportunity that its managers

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[2] Another type of credit constraints model focuses on imperfect information (Bernanke and Gertler (1989)); Froot and Stein (1991); Gertler and Hubbard (1988); Greenwald, Stiglitz, and Weiss (1984); Myers and Majluf (1984)). We believe that this approach, when applied to liquidation, would yield results similar to the ones reported here.
[3] We discuss this assumption in Section IV.

want to take; hence, the agency problem. For simplicity, we assume that such an opportunity does not arise in the depression.

So far, the two firms are completely symmetrical. However, we assume that, in the depression, one firm is hit harder than the other with a low cash flow. As a result, the possibility arises that the harder hit firm (the seller) is liquidated, and sold to the other firm in the industry (the buyer) or an industry outsider. A key distinction between the insider and the outsider is that the cash flow of the assets of the seller in period 2 is higher under ownership by the insider. This may be because the insider is just a better operator, or because the outsider faces a bigger agency problem of hiring a manager to run these assets. We will also assume that the outsider has no debt overhang, and so can bid the full value of the firm under his management. As a result, the outsider might get the liquidating firm even if he values it less than the credit-constrained insider.

We first consider the capital structure of the selling firm, then the capital structure of the buying firm and finally the liquidation equilibrium. Figure 1 summarizes the timing of cash flows and decisions of the selling firm. Our notation is as follows. R is the future payoff from the investment, while I is the cost of the investment. Y is cash flow from existing assets. Superscripts refer to states, either prosperity or depression, while subscripts refer to periods 1 or 2. Note also that we assume the riskless interest rate is zero.

We make three substantive assumptions about parameter values:

Assumption S1: *Investment in prosperity has negative net present value*:
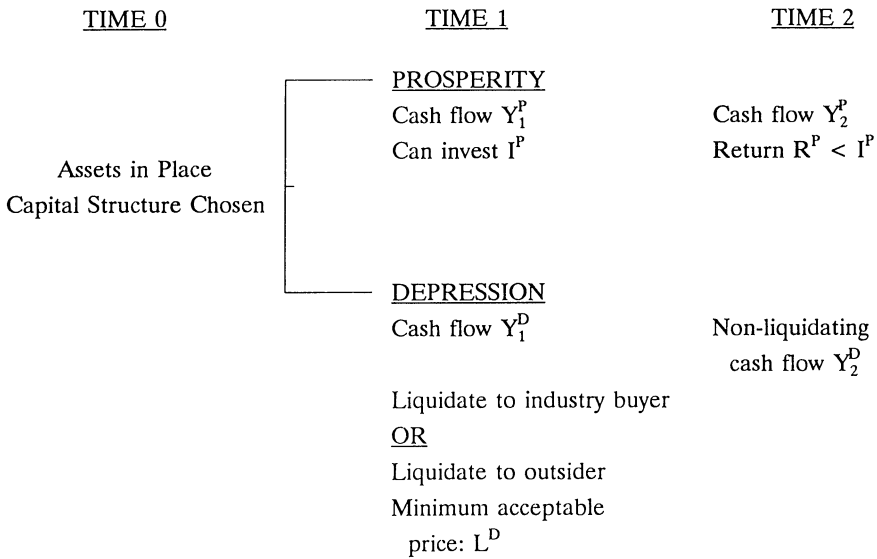
$$R^P < I^P.$$

Assumption S2: *Period 1 cash flow is higher in prosperity even net of the investment*:

$$Y_1^D < Y_1^P - I^P.$$

Assumption S3: *The overall cash flow is higher in prosperity than in the depression even net of the negative NPV investment*:

$$Y_1^P + Y_2^P + R^P - I^P > Y_2^D + Y_1^D.$$

Assumption S1 represents the agency problem and creates the need to use capital structure to control self-interested investments by management. Without S1, there is no need to use debt in the model. Assumptions S2 and S3 both say that prosperity is a much better state of the world than depression. Together they imply that a capital structure which is stringent enough to constrain managers from making bad investments in prosperity will actually put the firm into financial difficulty in the depression. If these assumptions do not hold, there will exist a capital structure that alleviates the agency costs in prosperity without entailing any distress costs in the depression. For example, if S3 holds but S2 does not, the optimal capital structure will call for a level of short-term debt that prevents the investment in prosperity but is still low enough that the firm can repay the short-term

TIME 0	TIME 1	TIME 2

PROSPERITY

Cash flow Y_1^P

Can invest I^P

Cash flow Y_2^P

Return $R^P < I^P$

Assets in Place

Capital Structure Chosen

DEPRESSION

Cash flow Y_1^D

Non-liquidating

cash flow Y_2^D

Liquidate to industry buyer

OR

Liquidate to outsider

Minimum acceptable

price: L^D

Figure 1. Timing for the seller. R is the future payoff from the investment, I is the cost of the investment, and Y is cash flow from existing assets. Superscripts denote states (either prosperity or depression) and subscripts denote time periods.

debt out of period 1 cash flow in depression. Conversely, if S2 holds but S3 does not, the first best can be obtained using long-term debt to constrain investment.

Hart (1991) studies the optimal period 0 capital structure when complete state-contingent contracts cannot be written. He shows that the capital structure that maximizes the wealth of period 0 shareholders, under Assumptions S1–S3, consists of senior debt D_2 due in period 2 and debt D_1 due in period 1. The function of junior short-term debt is to bring the firm to the capital market in period 1 rather than let it invest from the internal cash flow. Hart (1991) assumes that this debt cannot be rescheduled; we discuss this assumption in Section III. The function of senior long-term debt is to create debt overhang, so that a firm with a negative NPV investment opportunity cannot raise more money by issuing new securities. Both the long-term and the short-term debt, then, are used to discipline the management.

To prevent investment in period 1, these debt levels must meet the following conditions in prosperity:

Condition 1: $I^P > Y_1^P - D_1$: After paying debt, the firm does not have enough to invest without raising capital.

Condition 2: $I^P - Y_1^P + D_1 > Y_2^P + R^P - D_2$: Senior debt overhang precludes the firm from raising enough capital to invest.

Provided it pays initial investors to prevent the wasteful investment in prosperity (Condition 7 below), the optimal capital structure in this model

calls for debt levels D_1 and D_2 slightly above those given by Conditions 1 and 2, i.e.,

  Condition 3: $D_1 = Y_1^P - I^P + \epsilon$.

  Condition 4: $D_2 = Y_2^P + R^P + \delta$.

The debt levels D_1 and D_2 keep the firm from making the negative NPV investment in prosperity. What do they imply about the depression? First, Condition 1 and Assumption S2 together imply

  Condition 5: $Y_1^D < D_1$: The firm cannot meet the debt payments out of the current cash flow in depression.

Since we have assumed that the period 1 cash flow in prosperity net of investment exceeds the cash flow in the depression, the need to go to capital markets in prosperity implies the inability to pay debt in the depression.
  Second, Condition 2 and Assumption S3 together imply

  Condition 6: $D_1 - Y_1^D > Y_2^D - D_2$: The firm cannot postpone liquidation by raising enough cash on the capital market to pay off short-term debt.

Again, since prosperity even with the bad investment is more profitable than depression, a debt overhang that keeps the firm from making the bad investment in prosperity also prevents it from raising enough money to delay liquidation in the depression. In this model, then, so long as depression is sufficiently inferior to prosperity, the firm is turned over to the creditors in the depression.
  Following Hart (1991), we assume that the creditors liquidate the firm when it defaults on its short-term debt (we discuss this assumption in the next section). The main question of our analysis is at what price the firm is liquidated in the depression. From the viewpoint of the seller, the only constraint on that price is that it be high enough for the capital structure described above to be optimal. That is, the gains from avoiding the investment in prosperity must outweigh the losses from liquidation, rather than continuation, in the depression. The condition is:

  Condition 7: $\Pi^P(I^P - R^P) \geq \Pi^D(Y_2^D - L^D)$,

where Π^P and Π^D are probability of prosperity and depression, respectively. This means that the minimum acceptable price, L^D, is:

  Condition 8: $L^D = Y_2^D - \dfrac{\Pi^P}{\Pi^D}(I^P - R^P)$.

Note that liquidation in this model may well take place at a price below the value of second period cash flow under the incumbent, Y_2^D, for reasons of debt overhang.
  Hart (1991), as well as the rest of the literature, assumes that the actual liquidation value is exogenous. Our paper endogenizes this value. We assume that there are two potential buyers of the assets of the seller. First, there is

an industry outsider, who can generate a second period cash flow C_{out} from these assets. We assume that this outsider does not face debt overhang and so can bid up to C_{out} for the assets. Second, there is the industry insider, "the buyer," who can generate a second period cash flow $C_{\text{ins}} > C_{\text{out}}$ from the assets of the selling firm. Although the industry insider has a higher fundamental valuation of the liquidating firm's assets, he might not be able to pay this valuation because of his own debt overhang. The next question then is, how much can he pay?

To answer this question, we need to analyze the problem of the buyer. We treat the buyer almost symmetrically to the seller, except that we use small letters. So, the timing of the buyer, presented in Figure 2, is virtually the same, except that the period 2 problem in the depression is whether to buy the liquidating firm.

Assumptions B1 and B3 parallel the assumptions for the seller and are used for the same reasons:

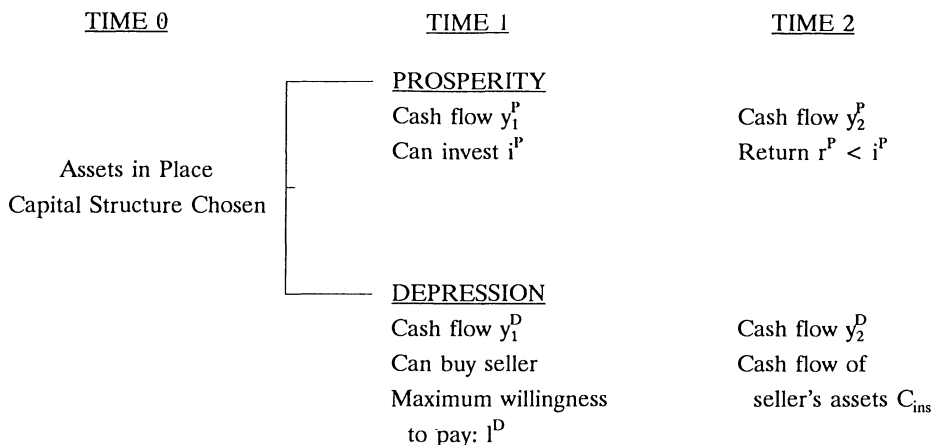Assumption B1: *Investment in prosperity has negative net present value*:

$$r^P < i^P.$$

Assumption B3: *The overall cash flow is higher in prosperity than in the depression even net of the negative NPV investment*:

$$y_1^P + y_2^P + r^P - i^P > y_2^D + y_1^D.$$

However, Assumption S2 for the seller is now replaced by:

Assumption B2: $0 < y_1^D - y_1^P + i^P < C_{\text{out}}$.

<table>
<tr><td>TIME 0</td><td>TIME 1</td><td>TIME 2</td></tr>
<tr><td></td><td>PROSPERITY</td><td></td></tr>
<tr><td></td><td>Cash flow y_1^P</td><td>Cash flow y_2^P</td></tr>
<tr><td></td><td>Can invest i^P</td><td>Return $r^P < i^P$</td></tr>
<tr><td>Assets in Place
Capital Structure Chosen</td><td></td><td></td></tr>
<tr><td></td><td>DEPRESSION</td><td></td></tr>
<tr><td></td><td>Cash flow y_1^D</td><td>Cash flow y_2^D</td></tr>
<tr><td></td><td>Can buy seller</td><td>Cash flow of</td></tr>
<tr><td></td><td>Maximum willingness</td><td>seller's assets C_{ins}</td></tr>
<tr><td></td><td>to pay: 1^D</td><td></td></tr>
</table>

Figure 2. Timing for the industry buyer. r is the future payoff from the investment, i is the cost of the investment, and y is cash flow from existing assets. Superscripts denote states (either prosperity or depression) and subscripts denote time periods.

The first part of the inequality is the reverse of S2; it will imply that the buyer's cash flow in the depression is high enough that he does not have to be liquidated. This assumption captures our key distinction between the buyer and the seller, namely that the former is hit less hard in the depression. If the first part of the inequality in B2 is reversed, the buyer like the seller will be liquidated and our result that assets are allocated to low valuation buyers would be even stronger. The second part of the inequality in B2 will imply that the buyer does not have enough internal cash flow to buy the seller's assets for C_{out}, the outsider's valuation. If the buyer wants to get the seller's assets in the depression, he must go to the external capital market. In equilibrium, in fact, he would sometimes not be able to raise cash there either, because of debt overhang.

Denote debt levels by d_1 for short-term debt, and d_2 for senior long-term debt. Then the levels necessary to keep the buyer from investing in prosperity satisfy:

Condition 9: $i^P > y_1^P - d_1$: the buyer needs to come to the capital market in prosperity in order to invest; and

Condition 10: $i^P - y_1^P + d_1 > y_2^P + r^P - d_2$: Debt level is too high to raise money to invest.

These conditions, of course, are exactly the same as 1 and 2 for the seller. The minimum debt levels d_1 and d_2 that satisfy 9 and 10 and so keep the firm from investing in prosperity are the same as those given by 3 and 4 for the seller:

Condition 11: $d_1 = y_1^P - i^P + \epsilon$.

Condition 12: $d_2 = y_2^P + r^P + \delta$.

Can the buyer burdened with d_1 and d_2 acquire the seller in the depression? Let l^D denote the *maximum* price such that the buyer can raise enough money to pay this price for the seller. The buyer can acquire the seller either if he has enough cash flow to do it outright in the depression or if he can raise money to do it. But the first inequality in B2 implies that the buyer does not have enough internal cash flow to buy the seller without borrowing. The buyer can borrow to buy the seller provided that:

Condition 13: $l^D < (y_1^D + y_2^D) - (y_1^P + y_2^P + r^P - i^P) + C_{ins}$.

This is the key condition of the model. Remember that the difference between the first two terms is negative under the Assumption B3 because depression cash flows are much lower than prosperity cash flows. This means that the maximum price that the buyer can afford to pay for the seller is strictly lower than the cash flow of the seller under the buyer. The reason is debt overhang: the buyer simply cannot raise money to pay the value of the seller under his management. In fact, if prosperity is much better than depression, the price the industry insider can pay might be much below the fundamental value under his management. In sum, the buyer can only buy the liquidating firm in the depression if the price is below l_D given by Condition 13.

Before analyzing who buys the firm in liquidation, we should remember that there is also a condition that says that it is in the interest of the initial owners of the buyer to create the debt overhang to avoid investment in prosperity. This condition is parallel to Condition 7 for the seller. The gains to avoiding such an investment must exceed the losses from not getting the liquidating firm in prosperity, i.e.,

Condition 14: $\Pi^P(i^P - r^P) > \Pi^D(C_{\text{ins}} - \text{liquidation price})$.

If the liquidating firm can be gotten for a price so low that Condition 14 fails, then the buyer's shareholders will not impose the debt overhang in period 0 because of the possibility of making a very cheap acquisition in the depression.[4]

So who gets the liquidating firm? If l^D, the maximum price that the industry buyer can pay, exceeds the cash flow under the outsider, C_{out}, then this industry insider gets the firm for the price C_{out}. He is the more efficient of the two buyers, although he might still be less efficient than the incumbent. In this case of the nonbinding debt-overhang, assets do move to the more efficient of the two potential buyers. One way to interpret this case is that the seller experiences an idiosyncratic shock, or perhaps a much more severe version of the aggregate shock than other firms in the industry, and so one of these firms manages to raise capital and acquire his assets.

The case of most interest, however, is when the maximum price l^D that the buyer can pay, given by Condition 13, is below the cash flow C_{out} under the outsider, but still high enough that it is optimal for the buyer's investors to impose debt overhang (i.e., Condition 14 holds). This can occur even though the cash flow under the industry buyer exceeds the cash flow under the outsider. The firm is then sold to the outsider, who has a lower fundamental valuation but does not face credit constraints, rather than to the high valuation industry insider who has a heavy debt overhang. The firm is thus sold for a price below the second highest fundamental valuation and does not end up in the hands of the highest valuation buyer.

The liquidation price will be l^D given by Condition 13, as the industry insider loses the auction to the outsider, who ends up paying the insider's maximum ability to pay. This will be the equilibrium assuming that, at this price, the buyer and the seller are both willing to put in place the debt overhang capital structure, i.e., if Conditions 7 and 14 hold. The conclusion of this model, then, is that liquidation need not bring in the second highest fundamental valuation, but might instead bring in a lower price.

In the case we have focused on above, both the buyer and the seller choose to have debt overhang, and so there is an interior debt level for both the

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[4] Consistent with our assumptions for the seller, we do not allow renegotiation of the buyer's debt agreement once the state is revealed and the purchase opportunity becomes available. This no-renegotiation assumption is discussed in detail later on. For now, suffice it to say that this assumption is meant to capture the difficulty in overcoming a debt overhang in the presence of many dispersed creditors or significant information asymmetries.

buyer and the seller. These debt levels depend on the cash flows of the firms, and on the parameters of their investment opportunities in prosperity. So long as the equilibrium continues to be in the range where both firms use debt overhang, the levels of debt are independent of the liquidation price. However, when the liquidation price falls or rises enough, there may be a change in regimes and it may no longer be optimal for both firms to have debt overhang. For example, as $i^P - r^P$ falls, optimal debt overhang of the industry buyer rises, the liquidation price falls, and so at some point the owners of the seller might choose to move to the no-debt capital structure. In this discontinuous way, optimal debt levels of the seller fall as the liquidity of its assets falls. In a more general model with more states, one can imagine a continuously changing capital structure, with falling levels of debt as liquidation value falls and investors would choose to allow negative NPV investments in more states rather than have more frequent liquidations. Our model thus reflects an important general principle: optimal leverage or debt capacity falls as liquidation value falls.

Interesting results also obtain for the parameter values at which it does not pay for both the seller and the industry buyer to have debt overhang. For some parameter values, there are two equilibria. In the first equilibrium, the buyer has a debt overhang to prevent investment in prosperity, so he cannot pay much for the liquidating firm in the depression. The liquidating firm, if it were to have debt overhang, would then get sold in depression to the industry outsider at a price equal to what the insider with the overhang can pay. Faced with the prospect of such a low price in liquidation, investors in the selling firm choose to have no debt and to allow the negative NPV investment in prosperity. This in turn makes it very attractive for the industry buyer to have a lot of debt, since the first firm is not even for sale in the depression and nothing is given up by having more debt. In this equilibrium, the buyer has a lot of debt, and the seller has none.

But there is also a second possible equilibrium here. In this equilibrium, the seller has a debt overhang, and is liquidated in the depression. The buyer, however, recognizes that there is an opportunity to buy the liquidating firm in the depression at a price equal to the cash flow under the industry outsider, and therefore chooses to forego the debt overhang just to take this opportunity. The optimal debt level for the industry buyer is 0. In turn, the fact that the industry buyer is there to pay the relatively high price for the assets makes it attractive for the seller to have more debt. In this equilibrium, the seller has a lot of debt, and the industry buyer has none.

This case of two equilibria suggests the notion of an *industry debt capacity* in this model. While each individual firm can have a high or a low debt level depending on which equilibrium obtains, the aggregate industry debt level is approximately the same (if the buyer and the seller are similar). Either the buyer has a lot of debt, in which case the seller chooses to have none and so avoids liquidation, or the seller has a lot of debt in which case the buyer avoids debt to be ready to acquire the seller. But it would not be an equilibrium, for these parameter values, either for both firms to have a lot of

debt or for neither to have debt. The industry debt capacity reflects the desirability of both, avoiding some wasteful investment in the industry, and also of preventing the sale of liquidating firms to industry outsiders. The existence of an industry debt capacity, even when the debt capacity of any individual firm may vary widely depending on which equilibrium obtains, is perhaps the clearest example of the general equilibrium effect operating in this model.

C. Discussion of Illiquidity

The conclusion of the model is that the price of an asset in liquidation might fall below value in best use because some or all industry buyers have trouble raising funds. This result relies on the assumption that the shock is either industry- or economy-wide. An idiosyncratic adverse shock to the cash flow would not have the same effect. If the seller suffers a bad idiosyncratic shock, but other firms in the industry do not, these other firms will not have a debt overhang and will compete to drive the asset price in liquidation up to the fundamental value in best use. In fact, it is trivial to extend the model to allow for idiosyncratic shocks, in which case the seller is sold to the industry buyer if he experiences an adverse idiosyncratic shock, and to the outsider if the whole industry suffers. In the first case, there is no private or social loss from liquidation, but in the second case both the private and the social loss may be large.

The airline industry illustrates the crucial distinction between idiosyncratic and industry-wide shocks in this model. When in the mid-1980s some firms in the industry experienced idiosyncratic problems, such as Peoples' Express with overexpansion or Eastern with unions, their gates, routes, and planes were easily acquired by other airlines. More recently, when Eastern and Pan Am put their assets up for sale at a time when other airlines were themselves losing money, the potential buyers could not borrow money as easily and assets appeared to be selling at more "distressed prices." For example, in December 1991 United bought bankrupt Pan Am's Latin American routes for $135 million compared to the $215 million it had offered in late August and $342 million paid earlier to Eastern by American for similar routes.

The institution of airline leasing seems to be designed partly to avoid fire sales of assets: airlines can stop their leasing contracts when they lose money rather than dump airplanes on the market which has no debt capacity. Even leasing companies, however, have a limited debt capacity and, therefore, cannot absorb all the planes put on the market when an industry suffers an adverse shock.

The oil shipping business offers another interesting example. As cash flows from that business temporarily plummeted in the mid-1980s and owners could not meet their debt payments, many tankers were selling for scrap value. At that time, astute investors from outside the industry bought some tankers and mothballed them. Mothballing the tankers may well have been

the socially efficient strategy, but it seems likely that the sellers of the tankers bore a substantial private cost because they had to sell in a distressed situation where most of the informed potential buyers had little access to capital. At least in an ex post sense, the cost to the tanker sellers was large. Outside investors appear to have made a 700 percent return on their tanker investments over a five-year period.

The airline and shipping industries illustrate the critical role of deep pocket investors in maintaining some degree of asset liquidity during industry and economy wide recessions. We expect that in bad times pools of outside money will be organized to buy the distressed assets and hold them until the industry or the economy recovers. This process would certainly reduce the private costs of illiquidity. Unfortunately, the deep pocket industry outsiders often face substantial agency and informational deterrents to aggressive investment in particular industries. In addition, when the whole economy is in a recession, many potential industries compete for the funds of deep pocket investors, which raises their opportunity costs of committing funds to particular sectors. The pools of outside money are thus unlikely to eliminate the private costs of asset illiquidity. The social costs of management by industry outsiders remain as well, although these are lower when deep pocket investors develop some industry expertise.

It is important to stress that in many cases credit constraints of industry buyers, such as those resulting from debt overhang, are not the only factor that prevents them from buying distressed industry assets. Another potentially important barrier is regulation. For example, the United States Department of Transportation has historically prevented foreign airlines from buying assets of U.S. airlines, reducing the access of high valuation buyers to these assets and therefore reducing their prices. More importantly, antitrust regulation is an important factor that often prevents industry buyers from buying industry assets. In the 1960s, for example, it was virtually impossible to sell assets to competitors because of aggressive antitrust enforcement. These regulations have a similar effect to credit constraints: they reduce the liquidity of assets and the debt capacity for the firms in the industry.

III. Asset Sales More Generally

The model has provided a bare-bones illustration of how assets could be sold to a buyer with a low fundamental valuation. By focusing on the costs of asset sales, the model has missed some important issues. In particular, why do firms often *choose* to sell assets when debt rescheduling or raising new securities are potential alternatives? After all, asset sales are only one of several options a firm can pursue, and they must have some good properties to be chosen so often.

A firm that does not have enough cash to meet its interest payments, or is nearing that condition, has several options. It can try to reschedule its debt, either voluntarily or in Chapter 11; it can try to raise cash by issuing new debt or equity; or it can sell assets. All these options are costly. Consider first

debt rescheduling. In our analysis and in Hart (1991), it is simply disallowed by assumption. However, in this model it would sometimes pay the short-term creditors of the seller to postpone debt repayment if the liquidation is very costly, since even as junior creditors they could negotiate a mutually advantageous deal with the seller. It would also sometimes pay the short-term creditors of the industry buyer to postpone debt repayment because the acquisition of the seller is so lucrative. Debt rescheduling must have some costs that are not explicitly modeled to be avoided in these circumstances.

Several such costs have been discussed in the literature. First, debt rescheduling might require difficult and costly coordination between multiple creditors (Gertner and Scharfstein (1991)). Second, creditors might worry about the asset substitution problem, namely that the managers will take extra risks if the loan maturities are extended (Jensen and Meckling (1976)). These creditors would rather force liquidation than wait and risk the complete depreciation of their collateral, especially in the face of their inferior knowledge about future investment prospects and profitability. Third, creditors may suspect that the problems of the firm stem from bad management. This prospect also makes them wary of rescheduling and granting management more time. For all these reasons, debt rescheduling is often difficult.

What about new security issues? In our model, a security issue is simply impossible because the debt overhang from the senior long-term debt is so severe that no new securities can be issued. More generally, the uncertainty of the new security buyers about the value of the assets in place, including the quality of management, also raises the cost of security issues (Myers and Majluf (1984)). Finally, like the creditors who are wary of rescheduling the debt, buyers of new securities have to worry that the managers will squander the new cash rather than use it productively. Issuing new securities, then, is also an expensive option for the firm.

Asset sales can better deal with some of the problems that plague debt rescheduling and new security issues, and therefore sometimes become the most attractive choice.

First, proceeds from asset sales are typically used to repay debt. In fact, bond covenants often require that proceeds from the sale of assets be used to pay down debt (Smith and Warner (1979), p. 127). As a result, asset sales alleviate the asset substitution problem, since creditors get cash today rather than waiting and fully exposing themselves to the riskiness of the firm.

Second, because proceeds from asset sales not only substitute for fresh credit but also reduce creditors' exposure, creditors do not have to worry as much about the quality of the management or of its projects. Hence, the asymmetric information problem which plagues new security issues and debt rescheduling is also less severe. While asset buyers from the industry must still put a value on a portion of the firm's assets in these transactions, these are precisely the agents most capable of doing so. A key advantage of asset sales over other ways of obtaining cash or credit in financial distress is that the informational asymmetries are likely to be much smaller when dealing with informed industry insiders.

Third, because control over the assets is turned over to the buyers when assets are sold, these buyers, unlike the buyers of new securities, do not have to worry as much about agency problems in the management of the assets.

Fourth, when asset sales generate substantial proceeds and some debt is repaid, the need for extracting concessions from many dispersed creditors is eliminated. Also, the number of creditors, and therefore the number of conflicts between creditors, usually falls. In this way as well, asset sales might be preferred to rescheduling.

Finally, when a firm sells assets that are valuable, but do not generate current cash flow, it can relieve its debt burden without sacrificing its current income, or its ability to service other debt in the near future. Such assets might include businesses that are temporarily losing money, as well as growth businesses. Of course, if the industry buyers are themselves credit constrained, assets with high fundamental values but low current cash flows would sell at the largest discounts to their values: they would be the least liquid. But assuming that credit constraints are the tightest on the liquidating firm, it is probably still attractive to sell these assets. By doing so, this firm can avoid default not just immediately, but in the near future as well.

Overall, in some cases asset sales can lessen conflicts between creditors, reduce the asset substitution problem, control agency costs, and alleviate the informational asymmetry between the firm and outsiders, all without sacrificing the firm's ability to survive in the future. In these cases, they are the cheapest—though not a free—way to avoid complete liquidation and keep the creditors at bay. Of course, when the firm's assets are sufficiently illiquid, debt rescheduling or the issue of new securities might be the preferred alternatives, expensive as they are.

IV. Asset Liquidity and Debt Capacity

Our model explains how asset illiquidity reduces the optimal amount of debt in the capital structure. While having more debt prevents inefficient investment, it also causes more frequent costly liquidation. The result might be an interior level of debt that trades off these benefits and costs. This logic has substantial implications for the cross-section of financing patterns. Specifically, illiquid assets are poor candidates for debt finance, and vice versa for liquid assets. Asset liquidity creates debt capacity because liquid assets are in effect better collateral.

It is hard to know how big the illiquidity costs of distress are. Real estate appraisers typically assume that the rapid sale of real estate leads to price discounts of 15 to 25 percent relative to the orderly sale that might take several months. Kaplan (1989) cites Merrill Lynch estimates that the distressed sale of the Campeau retail empire would bring about 68 percent of what an orderly sale would bring. The New York Times reported that the rapid sale discount on the Trump Shuttle may be as much as 50 percent. Holland (1990) cites discounts of 50 to 70 percent off normal prices in a case study of liquidation of assets of a machine tool manufacturer.

In addition to suggesting that debt capacity is limited, our approach has a variety of implications for cross-sectional financing patterns. Liquid assets should be more extensively financed by debt. Williamson (1988) has argued that "redeployable" assets are liquid and thus are good candidates for debt finance, but this is only part of the story. Our model predicts that growth assets such as high technology firms and cyclical assets such as steel and chemical firms are illiquid because industry buyers of these assets are likely to be themselves severely credit constrained when the owners of these assets need to sell. Industry buyers of cyclical assets are constrained because they are hit by the same macroeconomic shock. Industry buyers of growth assets are virtually always credit constrained because they have so little cash relative to the value of these assets. Cyclical and growth assets are therefore poor candidates for debt finance, unless they are readily understood by deep pocket investors outside the industry.

Growth and cyclical assets are usually considered to be poor candidates for debt finance because they have a high probability of a low cash flow and default on debt. But even an asset with a reasonable chance of default may have a high debt capacity if it can be easily sold for fundamental value when default occurs. If, on the other hand, cyclical and growth assets are extremely illiquid in a recession, costs of financial distress are large, and financing these assets with debt is costly. Airline gates and routes, tankers and industrial equipment are, ceteris paribus, poor candidates for debt finance precisely because industry buyers are themselves in trouble in a recession, and so these assets are highly illiquid. Illiquidity is an important reason for low debt capacity of cyclical and growth assets.

The theory also predicts that smaller firms are ceteris paribus better candidates for debt finance. The caveat is important because small firms might be uninteresting to very many buyers, since they are too specialized, in which case the thin market reason for illiquidity might be more important than credit constraints of buyers. The way to test this prediction is to look at an industry where firms of different sizes operate together, and to see if smaller ones have more debt. Chan and Chen (1991) find that, within industry, smaller firms are more leveraged than larger firms, although they do not distinguish firms that freely choose high leverage from firms who temporarily have leverage above the long-run optimum level due to a large unanticipated drop in market value.

The theory also predicts that conglomerates are better candidates for debt finance than pure plays of the same size. This is true for several reasons other than the usual reason that conglomerates tend to have lower cash flow volatility and therefore a lower probability of not being able to meet debt payments. First, a conglomerate in need of cash has the option of selling assets in several different industries. This allows the conglomerate to avoid selling assets whose underlying industries are illiquid as long as it has sufficient assets in liquid industries. Second, a conglomerate has the option of selling its assets off in smaller, more liquid pieces without adversely affecting either the value of the divested assets or the assets kept in the firm. The ease of separability and the smaller degree of synergy between pieces of the firm

give the conglomerate more flexibility to sell off some pieces of the firm while retaining control of others. This argument also applies to firms that are not literally conglomerates. All other things being equal, a business consisting of a loose affiliation of different parts should have a higher debt capacity. For example, a company whose principal assets are 10 cable franchises in different cities has more flexibility in selling off assets and would therefore have more debt capacity than a similar-sized company operating in only one city.

V. Changes in Liquidity Over Time

Our discussion thus far has focused on cross-sectional variation in liquidity and in debt capacity. Liquidity also changes over time. Optimal debt levels are determined not by today's liquidity, but by liquidity over some planning horizon during which the asset might be sold. Investors must then make forecasts of future liquidity to establish the optimal capital structure.

How persistent is asset liquidity? For most assets without alternative uses, two key determinants of liquidity are participation and cash flow of industry buyers. Constraints on participation by industry buyers tend to be determined by laws and institutions, and so probably change slowly. Corporate cash flows tend to be fairly persistent as well, largely because the conditions in an industry and in the economy typically change slowly.[5] Corporate cash reserves are probably even more persistent than cash flows, since stocks change less rapidly than flows. Because industry buyer participation and cash flow are persistent, liquidity would tend to be fairly persistent as well. If an asset is liquid today, people probably expect it to be liquid for a couple of years. Today's liquidity is then generally associated with today's debt capacity.

Although liquidity should be persistent, it should also change over time. Changes in liquidity lead to changes in the optimal debt level. High markets are generally believed to be liquid and low markets to be illiquid. That is, fundamental values rise at the same time as prices come closer to fundamental values. Housing markets and markets for companies illustrate this principle. Below, we offer some reasons why high markets are liquid markets.

A. Why High Markets Are Liquid Markets

The most important reason that liquidity changes over time, and that high liquidity goes together with high asset values, is that industry cash flows drive both value and liquidity. In particular, industry cash flows change dramatically over the business cycle. When the cash flows of industry *buyers* are high, they are more likely to be able to finance asset acquisitions. This raises the liquidity of these assets. Also, fundamental values of assets rise with their *own* cash flows. In part, this is because current cash flows are part of the value, but also because cash flows are likely to be persistent, and so buyers extrapolate current cash flow levels into the future.

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[5] For evidence on the high persistence of output over time, see Cochrane (1988).

We see, then, that the fundamental value of an asset rises with its own cash flow, and its liquidity rises with its potential buyers' cash flow. When cash flows of the asset and of its potential buyers rise at the same time, as they would in an industry or general business upturn, both fundamental values and liquidity rise. In such markets, prices are high both because fundamental values are high, and because prices assets fetch are closer to these values since industry buyers are able to finance their purchases. High markets are thus liquid markets. A lot of transactions often take place in such markets, since sellers are willing to part with their assets at prices close to already high fundamental values even without financial distress. In low markets, in contrast, sellers get prices below already-low fundamentals because assets are illiquid. As a result, fewer transactions take place and those that do tend to be forced liquidations.

Another key determinant of both fundamental values and liquidity is the number of potential buyers. Changes in government regulation, such as antitrust policy or limitations on foreign investment, can bring more industry buyers into the market. In real estate markets, lower mortgage rates can be the source of new buyers. If some of these new buyers are high valuation buyers, the influx has the effect of raising fundamental values. But the entry of new buyers also raises the liquidity of the assets. Hence, a broadening of the set of buyers simultaneously increases asset prices and asset liquidity, and accounts for the coincidence of high markets with liquid markets. As liquidity rises, debt capacity rises as well because of the possibility of reselling to one of the many new buyers.

B. Self-Fulfilling Liquidity and Debt Capacity

In our discussion so far, we have focused on exogenous changes, such as those in cash flow or in the number of buyers, as the reasons for increased liquidity and debt capacity. But to some extent, these processes are self-reinforcing. When liquidity increases, by definition assets sell at prices closer to their values under best management. Someone who wants to buy a different asset from the one he owns can sell it at a price close to value in best use and buy another one. Such buyers would tend to avoid an illiquid market because they would not be sure that they can sell their own assets on good terms. As such, buyers enter the market in the belief that they can easily resell this or some other asset should the need arise; they each help to increase liquidity further and their beliefs thus become self-fulfilling.

This analysis might be germane to housing markets, where people might try to buy houses only if they know that they can sell theirs on attractive terms. When a housing market is liquid, many people are willing to be buyers and sellers, reinforcing this liquidity. In contrast, when a market is illiquid, people do not become buyers because they can't sell their old house at a good price, and so the market stays illiquid. In liquid markets, there are many transactions, high prices, and high debt capacity because the resale market is good. The reverse is true in illiquid markets. Similarly, corporations might

trade divisions to find best matches in liquid markets because they know they can sell poor matches, and abstain from trading in illiquid markets, thus keeping them illiquid.

There is an additional important feedback from debt capacity to liquidity. People borrow and banks lend in liquid markets because resale is attractive. But resale is made more attractive by the ability of future buyers to borrow. So the ability to borrow increases liquidity, which in turn raises the ability to borrow. In our real estate example, buyers might choose debt finance precisely because they know that if they need to resell, other buyers would have access to debt finance. In this way, not only does liquidity create debt capacity, but debt capacity creates liquidity.

These feedback effects might be strong enough to generate multiple equilibria. In one equilibrium, assets are illiquid and are not bought with debt because buyers recognize that, if assets need to be resold, other buyers could not themselves borrow at attractive terms. In another equilibrium, assets are liquid and buyers use debt to finance them because they expect they can resell them to other buyers who will also have access to debt at attractive terms. People can borrow solely because others they trade with can borrow. In principle, these two equilibria can coexist, holding constant both the number of potential buyers and the cash flow. Widespread belief in high liquidity and debt capacity can be self-fulfilling.

VI. Takeover Waves and Leverage Increases: The Experience of the 1980s

One application of our theory is to takeover waves. Asset acquisitions—such as takeovers, selloffs and divestitures—are highly procyclical (Golbe and White (1988)). This fact is surprising unless one focuses on asset liquidity. If assets sell for their fundamental values, and if capital markets are perfect, there need be no cyclical pattern to acquisitions. If, in addition, forced liquidations are an important source of acquisitions, acquisitions should be *countercyclical*. In fact, we observe the opposite.

Asset liquidity helps account for the evidence. In recessions, many asset buyers are credit constrained and cannot pay the fundamental values for the assets. Sellers should then try to postpone the sale of assets until markets become more liquid. It is not so much that fundamental values are low when cash flows are low, but that prices are even lower than fundamental values when cash flows are low. By comparison, when cash flows are high, sellers can get prices close to fundamental values since buyers are not credit constrained. Sellers should therefore be willing to part with their assets more readily. The resulting volume of transactions is procyclical.

High corporate cash flows have characterized every takeover wave in this century. In the 1980s, however, an additional reason for increased liquidity was the rise in the number of buyers. Before 1986, the General Utilities doctrine combined with accelerated depreciation provided a tax reason for churning assets. In addition, there has been an influx of foreign acquirers,

particularly in food, chemical, electronics, and financial services industries. Most importantly, much of the increase in the takeover activity in the 1980s was in horizontal mergers owing to relaxation of antitrust enforcement. Bhagat et al. (1990) show that, once selloffs are accounted for, over 70 percent of the assets of targets of hostile takeovers end up in the hands of firms in the same industry as these assets.

The increase in the number and the cash flow of industry buyers raised liquidity and debt capacity, since firms could more easily take on debt expecting that they could sell assets and divisions at close to fundamental values if they could not meet interest payments. In fact, many loans during this period were made with a clear understanding that cash flow was insufficient to pay interest from the beginning and assets must be sold to pay down debt. Asset sales were not an unlikely contingency, but a certainty for these loans. Asset liquidity was therefore essential for these loans to be made. In this way, the liquid market for firms and divisions made possible large increases in bank debt and junk bond financing in the 1980s (Bernanke and Campbell (1988), Warshawsky (1990)). Enhanced liquidity made debt financing more attractive both in takeovers and for all companies that might think about asset sales.

Many of the leveraged acquisitions of the 1980s would not have been possible were it not for the liquid market for divisions. This new active market for large firms and their divisions—spawned in part by the relaxation of antitrust enforcement and in part by financial innovation—created the possibilities for debt finance conditional on rapid resale of assets, a practice often essential for leveraged buyouts (LBOs). Bhagat et al. (1990) document that on average 30 percent of assets were sold following a hostile takeover in the 1980s; this average is 40 percent for LBOs. Bustup takeovers are the extreme example of borrowing in anticipation of selling assets. Debt finance in anticipation of a resale of parts in a liquid market made the takeover wave of the 1980s so extensive and so concentrated among the large companies.

When companies were not optimally managed, their assets could be sold at prices above their values as part of these companies. In this case, the costs of a forced liquidation were actually *negative*, since assets could be sold for more than their status quo values. The increased liquidity of the market for assets raised division prices in divestitures, thus increasing the profitability of busting up mismanaged conglomerates. In this way, increased liquidity might have encouraged more efficiency improvements.

The view that the liquidity in the market for corporate assets increased debt capacity contrasts with the conventional view. That view credits junk bonds and other financial innovations with increased takeovers since junk bonds permitted the raiders to attack large companies. Our view is that the liquidity of the market for companies helped generate the growth of the junk bond market. First, takeover waves have taken place during many economic booms, and many takeovers were financed with debt before junk bonds became popular. Second, junk bond financing of takeovers did not really become significant until 1985, several years after the takeover wave of the

1980s became big (Kaplan and Stein (1990)). This fact suggests that taking on junk debt became attractive only after the market for assets became liquid enough. Liquidity seems to have created debt capacity and not just the other way around in the 1980s takeovers, although of course there were important feedback effects as well.

At the end of the 1980s, LBOs and the use of junk bonds declined sharply. Some of the causes of this decline were probably exogenous, such as the forecasted recession, the collapse of Drexel and of prices in the junk bond market, and the troubles of some visible LBOs such as Campeau and Southland. In addition, investors, scared by the few bad episodes, no longer expected markets for divisions to be liquid, and these expectations seemed to become self-fulfilling.

The troubles of the junk bond market meant that new LBOs could not be easily financed and old ones refinanced. But even seasoned LBOs that did not rely on further junk bond financing ran into trouble because their assets became illiquid. Many of these LBOs counted on asset sales to pay down debt (Kaplan and Stein (1991)). Asset illiquidity reduced proceeds from asset sales below previously expected levels, making debt repayment more difficult. In addition, asset illiquidity further weakened the junk bond market, since investors in junk bonds relied on asset sales for principal repayments. The troubles of the junk bond market and declines in asset liquidity reinforced each other, since asset liquidity depends on financing, and financing relies on liquidity. Highly-leveraged transactions will probably resume only when markets for corporate assets become more liquid.

VII. Conclusion

Asset liquidity is an important determinant of the costs of financial distress. This paper has focused on economy- and industry-wide determinants of asset liquidity. Our main conclusions are as follows:

(1) Asset liquidation—through an auction or other sale—does not necessarily allocate assets to the highest value users. As a result, assets with no alternative uses can fetch prices below value in best use when sold during an industry- or an economy-wide recession or when industry buyers are prevented from bidding by regulation. Such fire sales can have substantial private and social costs.

(2) Optimal debt levels are limited by asset illiquidity. For example, even holding cash flow volatility constant, cyclical and growth assets have a lower optimal level of debt finance. Similarly, conglomerates and multi-division firms have a higher optimal debt level at the same level of cash flow volatility.

(3) The optimal leverage of a firm depends on the leverage of other firms in its industry. An industry might have an optimal debt capacity even when its individual firms do not.

(4) Asset liquidity and therefore optimal debt levels change over time. High markets tend to be liquid markets. Beliefs in high liquidity of assets can be self-fulfilling.

(5) Well-documented increases in leverage in the 1980s, both by firms involved in corporate control transactions and by other firms, were attributable at least in part to the liquid market for corporate divisions. This liquid market for divisions was in turn the result of exogenous factors such as relaxed antitrust enforcement and the influx of foreign buyers as well as of an important self-reinforcing component. The widespread expectation of future liquidity and debt capacity created current liquidity and debt capacity.

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