Automatic bankruptcy auctions and fire-sales*

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Abstract

We test for fire-sale tendencies in automatic bankruptcy auctions. We find evidence consistent with fire-sale discounts when the auction leads to piecemeal liquidation, but not when the bankrupt firm is acquired as a going concern. Neither industry-wide distress nor the industry affiliation of the buyer affect prices in going-concern sales. Bids are often structured as leveraged buyouts, which relaxes liquidity constraints and reduces bidder underinvestment incentives in the presence of debt overhang. Prices in "prepack" auctions (sales agreements negotiated prior to bankruptcy filing) are on average lower than for in-auction going-concern sales, suggesting that prepacks may help preempt excessive liquidation when the auction is expected to be illiquid. Prepack targets have a greater industry-adjusted probability of refiling for bankruptcy, indicating that liquidation preemption is a risky strategy.

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1 Introduction

Will a bankruptcy system that automatically puts bankrupt firms up for auction produce fire-sales? While direct evidence on this issue is sparse, legal and financial scholars have expressed skepticism towards the workings of automatic bankruptcy auctions. For example, the perceived risk of auction fire-sale helped motivate the 1978 U.S. bankruptcy reform introducing court-supervised debt renegotiations under Chapter 11. Provisions for court-supervised reorganization were also adopted in several member states of the European Union in the 1990s. Observing the reform process in Europe, Hart (2000) comments that "I'm not aware of any group–management, shareholders, creditors, or workers–who is pushing for cash auctions". The auction mechanism is unpopular in large part due to widespead—but largely untested—concerns with illiquidity and fire-sales.[1]

Since a debt renegotiation system such as Chapter 11 involves costs of its own, the comparative efficiency of automatic auctions is an empirical issue.[2] Interestingly, there is growing use of relatively low-cost, market-based mechanisms to resolve bankruptcy in the U.S., indicating substantial concern with traditional Chapter 11 proceedings. These include "prepackaged" bankruptcies with a reorganization plan in place at filing (Betker, 1995; Lease, McConnell, and Tashjian, 1996), acquisition of distressed debt by "vulture" investors in order to make voting more efficient (Hotchkiss and Mooradian, 1997), and voluntary sales in Chapter 11 (Hotchkiss and Mooradian, 1998; Maksimovic and Phillips, 1998). Baird and Rasmussen (2003) report that more than half of all large Chapter 11 cases resolved in 2002 used the auction mechanism in one form or another, and that another quarter were prepacks.

This paper presents the first comprehensive empirical analysis of the tendency for automatic bankruptcy auctions to create fire-sale discounts in prices and debt recovery rates. We study bankruptcies in Sweden, where filing firms are automatically turned over to a court-appointed trustee who organizes an open cash-only auction. All targets are subject to a single uniform selling mechanism (open, first-price auction), and the bids alone determine the auction outcome

[1]Shleifer and Vishny (1992) formalize this concern in a model of industry illiquidity and conclude that "the policy of automatic auctions for the assets of distressed firms, without the possibility of Chapter 11 protection, is not theoretically sound".

[2]The literature on Chapter 11 points to costs associated with conflicts of interests and excessive continuation resulting from managerial control over the restructuring process. For early warnings of agency problems in Chapter 11, see e.g. Baird (1986), Bebchuk (1988), Jensen (1989), Aghion, Hart, and Moore (1992), Bebchuk and Chang (1992), Bradley and Rosenzweig (1992), and Baird (1993).

(continuation sale or piecemeal liquidation). As a result, the cross-sectional variation in auction prices are determined largely by demand-side conditions, which is ideal for the identification of fire-sale discounts. Our sample of 258 bankrupt firms are all private (bankruptcies among publicly traded Swedish firms were rare over the sample period), and the average pre-filing asset size is about $3 million. This is close to the average size for private firms filing for Chapter 11 (Chang and Schoar, 2006).[3]

A fire-sale discount results when the observed auction price is lower than an estimate of the assets' fundamental value (taken to represent the value in best alternative use). The literature highlights temporary demand-side conditions that may give rise to such a discount. For example, since financial distress tends to be contagious within an industry (Lang and Stulz, 1992), high-valuation industry rivals may themselves be financially constrained and unable to bid in the auction (Shleifer and Vishny, 1992; Aghion, Hart, and Moore, 1992). Industry debt overhang may also attenuate industry rivals' incentive to invest in the bankrupt firm (Myers, 1977; Clayton and Ravid, 2002). As industry rivals are unwilling to bid, the risk increases that relatively low-valuation industry outsiders win the auction—at fire-sale prices. The chance of this happening is greater for unique or specific assets with few potential buyers (Williamson, 1988).

Several U.S. studies present evidence on fire-sale discounts in *voluntary* asset sales, both in and out of Chapter 11. For example, Pulvino (1998, 1999) provide evidence of fire-sale discounts for the sale of individual aircrafts. Ramey and Shapiro (2001) and Officer (2007) study liquidity discounts associated with distressed plant closings and corporate targets outside of bankruptcy, and Acharya, Bharath, and Srinivasan (2007) examine recovery rates for U.S. firms defaulting on their debt. Our empirical setting differs fundamentally from these studies in that we examine *mandatory* auctions of entire bankrupt firms.

Thanks to the early data effort of Strömberg and Thorburn (1996) and their subsequent published work, much is already known about the workings of the Swedish auction bankruptcy system. Their prior research does not, however, present direct evidence on the impact of industry distress on auction prices and recovery rates, which is the focus here. Thorburn (2000) presents evidence that the auctions are speedy (lasting on average two months) and have low direct bankruptcy costs. Moreover, she finds that recovery rates are similar to those reported by Franks and Torous

[3]Less than one percent of all U.S. Chapter 11 filings are publicly traded companies.

(1994) for a sample of Chapter 11 cases with market value data for the new debt securities. She also reports that direct bankruptcy costs are lowest for bankruptcy filings where the target has privately worked out an acquisition agreement just prior to filing. These ”auction prepacks” play an important role in the empirical analysis below.

Strömberg (2000) develops and tests a model for the decision of the previous owner to repurchase the bankrupt firm (a saleback). He finds that salebacks are more likely to occur when industry financial distress is high, and conjectures that salebacks help preempt excessive liquidation. Our auction price data (not available in Strömberg's analysis) directly addresses this conjecture. If the transacting parties view piecemeal liquidation as the relevant alternative to a saleback, prices will on average be lower in salebacks than in non-saleback going-concern sales. Instead, we show that prices in these two categories of going-concern sales are indistinguishable. There is no evidence that saleback prices resemble those in piecemeal liquidations. Instead, we find significant average price discounts in *auction prepacks* relative to other going-concern sales, which is consistent with liquidation preemption.

Since severe economic decline causes firms to exit their industries at low prices (efficient liquidation), studies of fire-sale discounts face a fundamental identification problem: is a given low sales price due to temporary financial- or permanent economic distress? Similar to Pulvino (1998), we deal with this problem by estimating a cross-sectional model for the asset's fundamental value. This value estimate accounts for the tendency for firms that are liquidated piecemeal to have significantly lower economic value than firms that are acquired as going concerns. We then compute the difference between actual and model prices, also referred to as the ”price residual”. A fire-sale discount is said to exist if the price residual is adversely affected by measures of industry-wide illiquidity and financial distress. Since this fire-sales test is joint with the fundamental value model, we check for robustness to alternative model specifications, including a model that allows for endogenous selection of the going-concern versus piecemeal liquidation outcomes.

The main empirical results are as follows. First, there is evidence of conditional fire-sale discounts in auctions that lead to *piecemeal liquidation*. This conclusion holds for both auction prices and debt recovery rates, and it is robust to a model that allows the liquidation outcome to be endogenously specified. A one percent increase in industry distress reduces piecemeal liquidation prices by two percent. The probability of piecemeal liquidation is higher for targets with relatively tangible assets, and higher when industry-wide leverage ratios are high and the business cycle is in a downturn. Thus, industry-wide distress appears to simultaneously increase the odds of a piecemeal liquidation and reduce piecemeal liquidation prices, as predicted by the fire-sale hypothesis.

Second, price- and recovery rate residuals in going-concern sales are unaffected by industry distress, and there is no evidence of lower prices when the buyer is an industry outsider. This conclusion holds for salebacks as well, suggesting there is little scope for bypassing the discipline of the auction mechanism also when the buyer is the former target owner. The typical going-concern auction attracts five interested bidders and three actual bids, which appears sufficient to counter potential fire-sale tendencies.

Third, we observe that buyers in going-concern sales frequently structure the acquisition as a leveraged buyout as opposed to a merger. In a merger, the buyer finances the auction cash payment using retained earnings and the proceeds from securities issued on the acquiring firm. Thus, a merger requires internal financial slack. In a buyout, however, the target assets are placed in a new company, and the cash payment is raised by issuing securities directly on this buyout firm. The latter method is equivalent to the "project financing" method, which Myers (1977) shows will resolve the underinvestment problem caused by debt overhang. We find that bidders employ the buyout mechanism to the point where price- and recovery rate residuals in buyouts and mergers are statistically indistinguishable and independent of industry-wide distress. This suggests that the buyout method increases liquidity and promotes auction competition in continuation sales.

Fourth, facing the prospect of fire-sale discounts in liquidations, we hypothesize that the main creditor (the bank) counters excessive liquidation by promoting a pre-filing private workout (in the form of a sales proposal). As indicated above, prices in prepacks are significantly lower than prices in regular going-concern sales, which is consistent with the liquidation preemption hypothesis. Interestingly, despite the lower prepack prices, the bank's own recovery rate is no lower in prepacks than in regular going-concern auctions. It appears that the bank strategically promotes a prepack agreement when it is in its interest to do so.

Finally, we ask whether the target firms that are continued via prepacks, or are purchased by industry outsiders, are operated less efficiently than other going-concern sales. If prepacks represent attempts to avoid excessive liquidation, the target assets may be in relatively bad shape and difficult to restructure as a going-concern. We find the post-bankruptcy operating performance of prepack targets and targets of industry outsiders to be at par with industry rivals. However, the probability of bankruptcy refiling over the two years following the auction is significantly greater for prepacks, suggesting that liquidation preemption is a risky strategy.

The paper is organized as follows. Section 2 provides sample information and key auction characteristics. Section 3 presents our cross-sectional evidence on the existence of a fire-sale discount for the total sample. Section 4 focuses on potential price impacts of industry distress in auction prepacks and salebacks. Section 5 produces evidence on post-bankruptcy operating performance and bankruptcy refiling rates, while Section 6 concludes the paper.

2 Auction data and characteristics

2.1 The auction bankruptcy system

A Swedish firm may enter bankruptcy if it is insolvent.[4] Upon bankruptcy filing, control of the firm is transferred to an independent, court-appointed trustee with fiduciary responsibility to creditors. The trustee's main task is to organize the sale of the firm in an open, cash-only auction. Trustees are certified and supervised by a government agency ("Tillsynsmyndigheten i Konkurs"), which reviews the trustees' compensation and ability to hold a proper arms-length auction. The filing triggers an automatic stay of debt payments and prevents repossession of collateral. The firm's employees, including the management team, run the firm until it is auctioned off. All expenses incurred while operating in bankruptcy get super-priority.[5]

The bids in the auction determine whether the firm will be liquidated piecemeal or continued as a restructured going concern. As indicated above, going-concern sale takes place by merger, where the target is fused with the operations of the acquiring firm, or through a buyout, where the target assets are placed in an empty company set up by the buyer. In either case, the target's assets are transferred to the buying company while the debt claims remain on the books of the bankrupt firm.

[4]If the firm files the petition, insolvency is presumed and the filing approved automatically. If a creditor files, insolvency must be proven, a process that takes on average two months. In our sample, about 90% of the filings are debtor-initiated.

[5]The trustee may raise super-priority debt to finance the firm's activities until the final sale. Since the auctions are speedy there is little demand for such financing. There is a government wage guarantee applicable to unpaid wages for up to six months prior to bankruptcy filing, as well as up to six months following filing depending on the employee's tenure with the firm. During our sample period, the maximum guarantee was approximately $55,000 per employee.

The cash auction proceeds are distributed to creditors strictly according to absolute priority.

A prepackaged bankruptcy filing is subject to approval by secured creditors. Since the firm remains insolvent following the prepack sale—the cash proceeds from the sale are necessarily less than the face value of debt—it must file for bankruptcy. In a prepack filing, the trustee checks for conflicts of interest in the proposed asset sale. If the sale is overturned, the contract is voided and the trustee continues with the auction (where the prepack bidder may participate). In practice, prepack filings are almost never overturned (Thorburn, 2000).

The Swedish bankruptcy code also has provisions for renegotiating *unsecured* debt claims (so-called composition). A composition must offer full repayment of secured debt and priority claims (taxes, wages, etc.) and at least 25% of unsecured creditors' claims. In practice, composition is rare as the priority claims tend to be highly impaired in bankruptcy.

2.2 Sample characteristics

We start with the sample information on 263 bankruptcies compiled by Strömberg and Thorburn (1996) and Thorburn (2000). This sample originates from a population of 1,159 Swedish firms with at least 20 employees that filed for bankruptcy over the period January 1988 through December 1991. We expand the original data to include firm- and auction characteristics required for our fire-sale hypotheses. Of the 263 original auctions, three are excluded because the final outcome cannot be unambiguously classified as a going-concern sale or a piecemeal liquidation, and another two auctions are dropped due to lack of target financial data. Thus, our final sample contains 258 bankruptcy auctions. Of the 258 targets, 31% are manufacturing companies, 33% are wholesale and retail companies, 14% are construction companies, 11% are in the transportation industry and another 11% are hotels and restaurants.

Table 1 lists asset characteristics of the target firms, industry liquidity conditions, and auction outcome variables. Target asset characteristics and industry liquidity conditions combine to determine bidder demand and thus the auction outcome. As discussed below, we use the asset characteristics to model the target's fundamental value, and industry characteristics largely to examine the sensitivity of auction prices to fire-sale conditions.

2.2.1 Target asset characteristics

The literature on asset sales shows that distressed firms prefer to sell off relatively tangible, less productive (non-core) assets when raising cash to stave off bankruptcy.[6] This means that, at the time of the bankruptcy filing, some targets will have a high proportion intangible and illiquid assets. Highly specialized assets require unique managerial skills and have limited redeployment options, affecting both the fundamental value and the type of bidder that is likely to submit a continuation bid in the auction. To capture these effects, we employ five proxies for the state of the target assets, listed in Panel A of Table 1. The first is the pre-filing target book value, $Size$, defined as the logarithm of the book value of the target firm's assets as reported in the last financial statement prior to bankruptcy filing.[7] The bankrupt firms, which are all privately held, are typically small with an average book value of assets of \$2.3 million.[8]

Extensive pre-filing asset sales and general revenue decline cause $Size$ to overstate the actual size of the bankrupt firm at the time of filing. In fact, total proceeds from the bankruptcy sale averages only half of the pre-filing book-asset size. To capture some of the cross-sectional variation in the size reduction caused by pre-filing asset sales, we include the binary variable $Asset\ sales$. This variable, which is constructed from information in the bankruptcy trustee's report, takes a value of one if the report indicates significant pre-filing asset sales, and zero otherwise. Overall, larger firms and targets with more of its original assets intact are expected to generate higher auction prices.

We also include three proxies for the quality of the target assets. The first is pre-filing operating profitability, $Profit$ = EBITDA/sales, as reported in the last financial statement. Moreover, as Strömberg (2000), we capture asset uniqueness with the variable $Specific$, defined as book value of machinery and equipment over total assets (from the last financial statement). Third, the variable $Intangible$, defined as the fraction of total debt at filing that is unsecured, is used as a proxy for asset intangibility in the absence of market value data for our private firms. We expect the three proxies for asset quality to affect auction prices as well as the probability that the target will be

[6] See, e.g., Asquith, Gertner, and Scharfstein (1992), Ofek (1993), John and Ofek (1995), Kim (1998), and Maksimovic and Phillips (2001).

[7] The time from the last financial statement to the bankruptcy filing date is on average sixteen months.

[8] As is common for small firms, ownership concentration is high. The average CEO owns 60% of the equity (Eckbo and Thorburn, 2003).

sold as a going concern.

2.2.2 Industry liquidity conditions

Under the fire-sale hypothesis, industry liquidity affects bidder demand in the auction and hence the final auction price. Tests of the fire-sales hypothesis therefore amounts to examining whether sales prices are correlated with measures of industry liquidity and distress. Our analysis uses the 4-digit SIC industry of the target firm. Industry benchmarks are created for each target firm using financial information for the Swedish population of 16,000 firms with at least 20 employees provided by Upplysnings Centralen AB.

We use five proxies for industry conditions, listed in Panel B of Table 1. All industry information is measured in the year of the bankruptcy filing. Of the five variables, industry profitability and business cycle change are used to estimate the fundamental value of the target. Industry operating profitability, $Ind\ Profits$, is defined as EBITDA/sales of the median industry firm. The variable *Bus Cycle* measures the most recent change in the quarterly value of a composite business cycle index. The index components include gross national product (entering the index with a positive sign), producer prices (+), aggregate consumption (+), unemployment rate (-), and the aggregate number of corporate bankruptcy filings (-).[9]

The remaining three proxies are used to capture effects of industry financial distress on auction demand. We measure industry distress, $Ind\ Distress$, as the fraction of industry firms that files for bankruptcy the following year or has an interest coverage ratio (the ratio of EBITDA and interest income to total interest expense) less than one. On average, one-third of the industry rivals are classified as financially distressed in this sense. We measure industry leverage, $Ind\ Leverage$, using the median firm leverage (book value of debt over total assets) in the industry. The average industry leverage ratio is high: 0.78 for the overall sample. Finally, we include the number of firms in the 4-digit target industry, $No\ of\ firms$, as an indicator of potential demand for the target assets in the auction. As shown in Table 1, the average industry consists of 267 rivals.

[9]This data is from Statistics Sweden. The components are normalized with their respective mean and standard deviation and enter the index with equal weight.

2.2.3 Auction outcomes

Panel C of Table 1 shows six binary variables representing different auction outcomes. These outcomes indicate the nature of the asset restructuring (going-concern sale GC versus piecemeal liquidation PL of the target), whether the buyer is an industry outsider (*Outsider*), whether the buyer uses the buyout acquisition method (*Buyout*), whether a bidder was identified prior to filing and the filing came with a prepackaged takeover agreement (*Prepack*), and whether the buyer is a former owner of the target (*Saleback*). Finally, Panel C lists the total debt recovery rate (*Recovery*).

As shown in the top line of Table 1, of the 258 auctions, 200 targets are sold as going concerns, while 58 targets are liquidated piecemeal. The corresponding sample proportions (0.78 and 0.22) are shown in Panel C, using the indicator variables GC and PL. The variable *Prepack* shows that 27% or 53 of the 200 going-concern auctions are prepack filings.[10] The bankruptcy files contains information on prior links between the buyer and the bankrupt firm. Using this information, 63% or 122 of 193 going-concern sales are identified as salebacks to a former owner of the target firm. A total of 32 cases are both a prepack and a saleback, an interesting subsample which we examine in some detail below. The overall saleback propensity is similar across prepacks and regular bankruptcy filings.

We follow Strömberg (2000) and classify a buyer as an industry outsider if the buyer (i) is neither a former owner or employee of the target, and (ii) does not have the same 3-digit SIC code as the target, and is not otherwise identified as a direct target competitor. Strömberg also classifies piecemeal liquidations as sales to outsiders. However, we restrict the outsider indicator variable to going-concern sales, because the identity of the buyer is rarely identifiable from the bankruptcy file when the auction results in piecemeal liquidation. As shown in Panel C, *Outsider* has an average value of 0.26, indicating that 26% of the going-concern sales result in sales to an industry outsider.[11] It is reasonable to expect target industry insiders to have an advantage over industry outsiders in terms of their ability to create synergy gains from the takeover.

For 146 of the 200 continuation sales, we are able to classify the acquisition method as either

[10] While not shown in Table 1, in prepacks the median CEO owns 100% of the equity, possibly because prepacks require a voluntary coordination among the distressed firm's claimholders.

[11] While not shown in the table, the buyer is an industry outsider in 19 or 36% of the prepacks, indicating that a prepack often involves a wide search for a buyer prior to filing.

merger or buyout. As shown in Panel C, a majority (71%) are buyouts. Buyouts occur in 74% of non-prepack going concern sales and in 64% of prepacks (not shown in Table 1). In the remaining cases the target firm is merged into the pre-existing bidder company. 55% of the mergers and 66% of the buyouts are saleback transactions.

The debt recovery rate is defined as net auction revenue divided by total face value of debt. Note that, since auction revenue is determined in an open auction and paid in cash, this recovery rate is effectively measured using market values. The recovery rate averages 37% in going-concern sales and 26% in piecemeal liquidations.

2.2.4 Bidder competition

We obtain bid information from the auction files and through direct communication with auction trustees. In addition to maintaining a record of the actual bids, the trustees keep track of parties expressing a serious interest in participating in the auction. Some of the interested bidders proceed with a formal offer, while others are deterred by competition and never move beyond the expression of interest. The existence of a pool of interested bidders is interesting as it indicates the level of potential competition in the auction.

We have information on bidder interest in 102 of the 147 non-prepack going-concern sales. We do not track bid frequencies in prepacks nor in piecemeal liquidations since these are largely missing. In piecemeal liquidations, the number of bidders depends arbitrarily on the number of assets sold. In auction prepacks, the bid data is incomplete since the trustee approves the firm's sales agreement after the prepack buyer has been selected. Tracking a subsample of 33 prepacks with bid data, we find direct evidence of bid competition in only 5 (15%) of the cases.

Figure 1 shows the frequency distribution of actual and interested bidders across the subsample of non-prepack continuation sales. The number of actual bids ranges from 1 to 22, with a mean of 3.5. The number of interested bidders (which includes the actual bids) ranges from 1 to 40, with an average of 5.5 (median 3.0). There are multiple actual bids in a majority (63%) of the going-concern auctions. The bid frequency reported here for automatic bankruptcy auctions is somewhat higher than the number of bids per target in U.S. tender offers found by Betton and Eckbo (2000), and the number of bidders involved in pre-merger talks with targets found by Boone and Mulherin (2007). In sum, our auctions attract substantial bidder competition.

3 Do auction fire-sales exist?

3.1 The fire-sale hypothesis and test approach

In this section, we test for the existence of fire-sale discounts in auction prices and debt recovery rates. As stated in the introduction, industry distress may temporarily reduce auction demand and lower auction proceeds. Severe liquidity constraints may also result in the winning bidder being a relatively inefficient industry outsider. Let P denote the total proceeds from the auction. The analysis is carried out using auction prices p in logarithmic form, so $p \equiv ln(P)$. Total debt recovery rate is defined as $r \equiv (P - C)/D$, where C is direct bankruptcy costs and D is the face value of the target's total debt. The following hypothesis summarizes our key predictions:

> **H1 (Fire-sale hypothesis):** *Fire-sale discounts in auction prices and debt recovery rates increase with industry-wide financial distress, and are greater when the winning bidder is an industry outsider.*

We follow Pulvino (1998) and use a two-step procedure to test the fire-sale hypothesis. The first step identifies the fundamental values (absent industry liquidity constraints) by regressing p and r on a vector X_1 of target asset quality factors. The fundamental prices and recovery rates are defined as the predicted values $p^* \equiv \hat{\beta}'_{1p}X_1$ and $r^* \equiv \hat{\beta}'_{1r}X_1$ in these regressions (where the hat indicates OLS estimate). In the second step, the residuals $p - p^*$ and $r - r^*$ from the first step are standardized with the regression standard error and regressed on a vector X_2 containing proxies for fire-sale conditions. The vectors X_1 and X_2 are non-overlapping (except for PL, see below). We then use the OLS parameter estimates $\hat{\beta}_{2p}$ and $\hat{\beta}_{2r}$ to test whether the fire-sale factors in X_2 drive the final auction prices and recovery rates below their estimated fundamental values.

This two-step approach allows us to use the full sample in the first regression, while the second step may be restricted to subsamples. Also, since the two-step approach fixes the coefficients from the first step in the second-step residual regression, it highlights the first-step as a fundamental pricing model, and it allows easy interpretation of the second-step coefficients as the marginal impact of industry liquidity conditions. Below, we also report results for a single-equation approach to allow a direct comparison. Moreover, we implement a procedure to control for potential self-selection bias in OLS estimates given that bidders' choice between going-concern sale and piecemeal liquidation is endogenous. Since this procedure indicates that OLS estimates are consistent, we report primarily the OLS estimates throughout the paper.

3.2 The fundamental pricing model

Table 2 shows the results of the first-step regressions for p^* and r^* using the full sample of 258 auctions. The explanatory variables X_1 include a constant plus the following three groups of fundamental target valuation characteristics:

$$X_1 \begin{cases} \text{Target assets}: \textit{Size},\ \textit{Asset sales},\ \textit{Profit},\ \textit{Specific},\ \textit{Intangible}, \\ \text{Industry conditions}: \textit{Ind Profits},\ \textit{Bus Cycle} \\ \text{Auction outcome}: \textit{GC},\ \textit{PL} \end{cases} \tag{1}$$

All variables are as defined in Table 1. We argue that asset specificity and intangibility affect the value of the target as a going concern, regardless of industry liquidity conditions. Moreover, the fundamental target value is hypothesized to depend on contemporaneous industry profitability and the most recent quarterly change in the business cycle index.

Twenty-two percent of our targets end up being liquidated piecemeal, and it is imperative not to confound the absence of a going-concern premium in liquidations with a fire-sale discount. The typical going-concern premium in our data is 125% measured relative to a professional estimate of the piecemeal liquidation value made public by the trustee at the beginning of the auction. Our targets have similar book asset sizes one year prior to bankruptcy filing, so book asset size is not a predictor of the piecemeal liquidation outcome.

Since piecemeal liquidation occurs only when no bidder values the target as a going concern, the ex post liquidation outcome is a proxy for the lower fundamental bidder valuations ex ante. Consistent with this view, the average realized piecemeal liquidation price exceeds the trustee's piecemeal liquidation value estimate by only 8%. Moreover, whenever an auction leads to piecemeal liquidation, we observe no going-concern bids for the target—as if the liquidation outcome is apparent to all bidders.[12] We therefore include the indicator PL in the fundamental pricing model.

The regression models in Table 2 are all statistically significant with R^2 of 0.50 for the two

[12] The reverse is not true: When the target is sold as a going-concern, we sometimes observe competing bids for individual assets that lost out to the higher continuation bid.

auction price regressions. The regressions in Panel A show that the final auction price increases in $Size$ and falls with $Asset\ sales$, as expected. Auction prices decrease in $Intangible$, which suggests that bankruptcy is more costly for firms with a high proportion of intangible assets, as predicted by e.g. Williamson (1988). Auction prices are significantly lower in piecemeal liquidations.

We run separate regressions to test which variables in X_1 have coefficients that are significantly different across the outcomes PL and GC. The variable $Specific$ is the only one to pass this test and is therefore entered with separate coefficients for the two auction outcomes.[13] The interaction variable $Specific{*}GC$ has a significantly negative coefficient while $Specific{*}PL$ receives a positive coefficient. There is no significant impact on the final auction price of the pre-filing target profits, the contemporaneous industry profits, or business cycle change. Given the insignificance of the two industry conditions for the target fundamental value, we use the first regressions in panel A as our model for the fundamental price p^*.

Turning to the two debt recovery rate regressions in Panel B of Table 2, the regressions have an R^2 of 0.18 and 0.19, respectively. The reduction in R^2 from Panel A is primarily driven by the positive correlation between firm size and debt face value D (larger firms have more debt). This positive relation produces a negative correlation between size and the inverse of D, which is sufficient to offset the positive correlation between price and size, thus the insignificant coefficient on size.

The recovery rate regressions maintain the significantly negative effect of asset intangibility and piecemeal liquidation. As in Panel A, we run separate regressions to test which variables in X_1 have coefficients that are significantly different across the outcomes PL and GC. For the total recovery rate, $Profit$ and $Specific$ pass this test and are entered with separate coefficients for the two auction outcomes. There is now a significant impact of $Profit$, and this variable enters with a positive sign in the subsample of going-concern sales and with a negative sign in the piecemeal liquidation subsample. There is, however, no significant impact of asset specificity on the recovery rate. Finally, there is some evidence that recovery rates are greater when contemporaneous industry profitability is high, but with no impact of the business cycle change. In the remaining empirical analysis, we use the first of the two regressions in panel B as our model for the fundamental price

[13] Each of the remaining variables are constrained to a single coefficient across the two auction outcomes.

r^*.[14]

3.3 Residual regression tests

Recall that the dependent variable in the second step of the analysis is the standardized regression residuals from Table 2. The second-step vector X_2 of explanatory variables contains a constant plus the following two categories of variables:

$$X_2 \begin{cases} \text{Industry liquidity}: Ind\ Distress,\ Ind\ Leverage,\ No\ of\ firms \\ \text{Auction outcome}: GC,\ PL,\ Outsider,\ Buyout \end{cases} \tag{2}$$

Our primary industry liquidity variable is *Ind Distress*, which is based on bankruptcy filing frequencies and interest coverage ratios of rivals firms in the target industry at the time of the auction (as defined in Table 1). Moreover, we complement this variable with *Ind Leverage* in order to further capture adverse investment incentive effects of industry-wide debt overhang.

The third indicator of industry liquidity is *No of firms*. There are two potentially offsetting effects on auction prices of this variable. First, the greater the number of firms in the target's industry, the greater the degree of potential competition in the auction, which tend to increase auction prices. On the other hand, profit margins in highly competitive industries tend to be smaller, which reduces bidder valuations. The net effect on auction prices is an empirical issue.

3.3.1 Going-concern sale versus piecemeal liquidation

Table 3 shows the results of the second-step residual regressions for the full sample of 258 auctions. Although the overall explanatory power of the regressions is low, there are several interesting results. First, the regressions yield statistically insignificant coefficients for the industry distress variables *Ind Distress* and *Ind Leverage* in the overall sample (first regressions in Panels A and B). The number of firms in the target industry receives a negative coefficient that is significant at the 6% level. Thus, targets in larger industries tend to be associated with lower auction prices, possibly because profit margins and asset values in highly competitive industries are relatively small.

[14] Our main conclusions are unaffected of whether we use the first or the second regression model for r^*. Also, inclusion of industry dummies in the regressions in Table 2 does not alter our conclusions below concerning the existence of fire-sale discounts.

Second, as in step 1 above, we run separate regressions to test which variables in X_2 have coefficients that are significantly different across the auction outcomes PL and GC. $Ind\ Distress$ is the only variable to pass this test and is therefore entered with separate coefficients for the two outcomes ($Distress{*}GC$ and $Distress{*}PL$).[15] Importantly, there is no evidence of a negative effect of $Ind\ Distress$ in the subsample of going-concern sales, whether we use auction price residuals or recovery rate residuals as dependent variable.

Third, there is a statistically significant and negative interaction effect between industry distress and piecemeal liquidations. The coefficient on $Distress * PL$ is approximately -1.9 in the auction price regressions of Panel A, and -1.7 in the recovery rate regressions of Panel B. The p-values for this coefficient are approximately 0.03 in Panel A and 0.05 in Panel B. In each regression, the coefficient on $Distress * PL$ is also significantly different from the coefficient on $Distress * GC$. The negative and significant interaction effect between $Distress$ and piecemeal liquidation persists throughout the remaining tables with price and recovery regression specifications.

Fourth, the binary variable for the buyer being an industry outsider is not significant. If the outside buyer is less efficient than an industry insider (as presumed in the model of Shleifer and Vishny (1992)), the outsider may attempt to counter this inefficiency by rehiring a high-quality CEO. This happens rarely in our sample, however. Of the 39 cases where the buyer is an industry outsider and the new CEO could be identified, only four (10%) rehire the old CEO.[16] The absence of fire-sale discounts in outsider purchases, combined with the outsiders' decision not to rehire the old CEO, challenges the notion that industry outsiders are less efficient buyers that industry insiders.

The insignificance of the buyer's industry affiliation for auction prices contradicts a conclusion of Strömberg (2000) that sales to outsiders tend to have lower prices than sales to insiders (and which he labels a fire-sale cost). However, while we are comparing prices paid by industry insiders and outsiders in going-concern sales, Strömberg's comparison mixes continuation sales and piecemeal liquidations. In his analysis, sales to insiders are exclusively going-concern sales (40 cases), while sales to outsiders are primarily piecemeal liquidations (60 of 86 cases). The lack of a going-concern premium in piecemeal liquidations produces greater average prices in his group of insider sales

[15]We include the dummy PL to allow the two interaction effects $Distress*GC$ and $Distress*PL$ to have different intercept terms. As shown in the table, PL is insignificant here.

[16]In contrast, the old CEO is rehired in 82 (52%) of 133 insider sales where CEO retention could be identified.

regardless of any liquidity constraints and fire-sale discounts. Table 3 shows that there is no price impact of the industry affiliation of the buyer for continuation sales.

Fifth, average price residuals when the acquisition method is a buyout are indistinguishable from price residuals in mergers. As discussed above, buyouts allow otherwise liquidity constrained buyers to finance the cash bid externally. Moreover, the buyout method overcomes the underinvestment incentive resulting from debt overhang emphasized by Myers (1977). Absent liquidity constraints, or if the buyout method is available to all bidders, competition between buyers is expected to drive prices to the point where there is no impact of the acquisition method on final auction prices, which is what we observe in Table 3. Combined with the finding that bidders use the buyout method in the majority of the going concern sales, we conclude that the buyout mechanism is important for promoting auction liquidity.

We next test whether there is a differential price effect of distress in the subsamples of continuation sales to industry insiders and outsiders, respectively.

3.3.2 Industry affiliation of buyer

The first two regressions in Panel A and in Panel B of Table 4 explore effects of buyer industry affiliation. This is done by creating the interaction variables $Distress * Outsider$ and $Distress * Insider$. $Insider$ is defined as the complement to $Outsider$ in continuation sales, so that $Outsider + Insider + PL = 1$. Table 4 displays the results of estimating the following system of two equations (shown here only with the variables interacting with industry distress):

$$p - p^* = \begin{cases} {}_1\beta_2 Distress * Outsider + {}_1\beta_3 Distress * Insider + {}_1\beta_4 Distress * PL + ... \\ {}_2\beta_1 Distress + {}_2\beta_3 Distress * Insider + {}_2\beta_4 Distress * PL + ... \end{cases} \quad (3)$$

The first equation tests whether the industry distress coefficients are individually different from zero for the three subsamples $Outsider$, $Insider$ and PL. The second equation provides a direct test of whether the coefficients are also different from each other. Specifically, ${}_2\beta_3 \neq 0$ implies that ${}_1\beta_3 \neq {}_1\beta_2$, and ${}_2\beta_4 \neq 0$ indicates that ${}_1\beta_4 \neq {}_1\beta_2$.[17]

The regression results in Panel A show that the coefficient ${}_1\beta_2$ and ${}_1\beta_3$ are both statistically

[17] To see why, note that the second equation can be rewritten as

$$p - p^* = {}_2\beta_1 Distress(Outsider + Insider + PL) + {}_2\beta_3 Distress * Insider + {}_2\beta_4 Distress * PL + ...$$

insignificant, indicating that prices in sales to outsiders and insiders, respectively, do not depend on industry distress. The coefficient ${}_1\beta_4$ for $Distress * PL$ remains negative and significant (as in Table 3), and significantly different from the distress coefficient ${}_1\beta_2$ conditional on an outsider sale. The conclusion is similar when using the recovery rate residual as dependent variable (Panel B). Auction prices in going-concern sales are unaffected by industry distress, also when allowing for different effects across buyer industry affiliation.[18]

In sum, the fire-sale hypothesis H1 is rejected for auctions leading to sale of the target as a going-concern, a conclusion that contradicts Strömberg (2000). There is, however, evidence of conditional fire-sale discounts in auctions that lead to piecemeal liquidations. Controlling for the lower average fundamental value in a liquidation, price and recovery residuals in piecemeal liquidations are shown to interact negatively with industry-wide distress: A one percentage increase in *Ind Distress* is associated with a two percent decrease in piecemeal liquidation prices. Conditional on our fundamental pricing model being correct, this is evidence of a fire-sale discount. Overall, our finding of fire-sale discounts in piecemeal liquidations is comparable to conclusions in the extant literature on distressed asset sales (Pulvino, 1998, 1999; Ramey and Shapiro, 2001).

3.4 The probability of a going-concern sale

The previous analysis indicates a significant price-impact of industry distress only when the auction leads to piecemeal liquidation of the bankrupt firm. In Table 5, we examine determinants of the probability that the target is purchased as a going concern versus liquidated piecemeal. The explanatory variables Z in the model are the target asset characteristics and industry liquidity conditions observable at the beginning of the auction. Panel A shows binomial logit estimates, where the choice is between going-concern sale (N=200) and piecemeal liquidation (N=58). Panel B and C provide trinomial estimates, where the choice is between two types of going-concern transactions as well as piecemeal liquidation.

Let π_n denote the probability of outcome n. With three outcomes, the multinomial logit model

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Comparing these coefficients with the coefficients of the first equation, it follows that ${}_2\beta_1 = {}_1\beta_2$; ${}_2\beta_3 + {}_2\beta_1 = {}_1\beta_3$ and ${}_2\beta_4 + {}_2\beta_1 = {}_1\beta_4$.

[18] When performing tests analogous to those in Table 4 for the acquisition method, the coefficients on $Distress * Buyout$ and $Distress * Merger$ are also insignificantly different from zero.

is

$$\pi_n = \exp(\gamma_n' Z) / \sum_{m=1}^{3} \exp(\gamma_m' Z), \tag{4}$$

where γ_n is the vector of coefficients to be estimated for the n'th auction outcome. We are primarily concerned with the derivative of the n'th probability with respect to the kth characteristic in the vector Z, $\partial \pi_n / \partial z_k$. With two outcomes only (binomial estimation), $\pi_1 = 1 - \pi_2$ and this partial is simply given by the coefficient estimate γ_k in the vector γ. In the multinomial case, however, a change in z_k changes all probabilities simultaneously, so that

$$\partial \pi_n / \partial z_k = \pi_n (\gamma_{nk} - \sum_{m=1}^{3} \gamma_{mk} \pi_m). \tag{5}$$

where γ_{nk} is the parameter for the kth explanatory variable in the vector γ_n.

Panel A provides the coefficient estimates γ and their p-values. The likelihood ratio test statistic (LRT) indicates that the regression model is significant at the 6.5% level. None of the individual coefficients are significant at the five percent level, while four coefficients are significant at the ten percent level. These four coefficients are for the variables *Specific*, *Intangible*, *Bus Cycle* and *Ind Leverage*. The probability of a going-concern sale is hence greater the more specific and intangible the target assets. This makes intuitive sense as firm-specific rents tend to be greater for such asset characteristics and a piecemeal liquidation eradicates going-concern rents. Thus, bidders are more likely to submit continuation bids when the loss in value from a piecemeal liquidation is relatively high. Moreover, the probability of the auction resulting in a going-concern sale increases with the recent uptick in the business cycle *Bus Cycle*.

Interestingly, while the industry distress variable played an important role in the above price-residual regressions for piecemeal liquidation, this variable does not affect the decision to liquidate. The coefficient on *Ind Distress* is 1.99 with a p-value of only 0.10. Piecemeal liquidation is, however, significantly more likely when industry leverage is high. The coefficient on *Ind Leverage* is -4.45 with a p-value of 0.05. Industry distress and industry leverage are, of course, correlated: the Pearson correlation coefficient between these two variables is a significant 0.29. Thus, according to Panel A, the odds in favor of continuing the target as a going concern (relative to piecemeal liquidation) is lower when the auction takes place during industry-wide distress. Together with the earlier price-residual results, the evidence indicates that industry-wide distress simultaneously increases the odds of a piecemeal liquidation and reduces piecemeal liquidation prices. It is possible that industry-wide economic (not just financial) distress accelerates industry exit and lowers liquidation sales prices.

In the model framework of Shleifer and Vishny (1992), fire-sale prices is the result of relatively inefficient industry outsiders winning the auction for the target. We have already shown that auction prices in going-concern sales are statistically independent of the industry association of the buyer. Panel B of Table 5 further shows that the probability that an industry outsider wins the target in a going-concern bid (N=53) is unaffected by the distress variables *Ind Distress* and *Ind Leverage*. In contrast, several of the coefficients for the buyer being an industry insider (N=147) are significant: buyers are more likely to be an insider when the target assets are relatively intangible, and in periods of business cycle upturns. In terms of industry distress, however, the evidence is mixed. The probability that the buyer is an insider is increasing in *Ind Distress* and falling in *Ind Leverage*. While the net impact of industry distress is ambiguous, it does appear that industry insiders are willing to bid during industry distress provided that there has also been a recent uptick in the business cycle.[19]

Finally, Panel C separates going-concern sales via merger (N=42) versus buyout (N=104). This regression is statistically significant with a p-value of 0.03. Buyers are more likely to select the buyout method the greater the target asset size, the more specific and intangible the target assets, and during a business cycle increase. The choice of the buyout mechanism is, however, statistically unrelated to industry distress variables. *Ind Distress* is a predictor of the piecemeal liquidation outcome (p-value of 0.07) but not of the acquisition method in going-concern sales.

3.5 Correction for self-selection of the auction outcome

The results in Table 5 show that bidders use target asset characteristics such as *Specific* and *Intangible*, in addition to various unobservable characteristics, to select a going-concern sale over piecemeal liquidation. Recall that our pricing model also includes an indicator for the auction outcome. If the residuals from the self-selection model $\gamma' Z$ are correlated with the residuals from

[19]The results of Panel B should be interpreted with caution, however, as the regression χ^2 statistic has a p-value of only 0.15.

the pricing model, then OLS estimation of the pricing model yields biased coefficients.

To correct for this bias, the standard approach is to include the inverse Mills ratio based on the choice model $\gamma' Z$ as an additional explanatory variable in the pricing model regression.[20] We use as our selection model the variables Z as listed in Panel A of Table 5, and where the coefficients γ are estimated using probit. Define the inverse Mills ratio λ such that $\lambda = \phi/\Phi$ if the auction outcome is a going-concern sale and $\lambda = -\phi/(1-\Phi)$ if piecemeal liquidation, where ϕ and Φ are the standard normal density- and cumulative distribution functions evaluated at the predicted value $\hat{\gamma}' Z$. If the coefficient on λ is statistically significant, OLS-estimation are biased and inconsistent.

The regression results are shown in Table 6. In Panel A, the dependent variable is the logarithm of the auction price (p), while in Panel B it is the debt recovery rate (r). Each Panel contains two regressions. The first is estimated using OLS, while the second uses WLS and includes the correction term λ for self-selection. Notice first that these regressions combine the fundamental asset characteristics from Table 2 with the industry liquidity conditions from Table 3 into a single regression specification. Thus, we are here relaxing the constraints on the coefficients from the fundamental pricing variables in the earlier standardized price residual regressions. The key result, that auction prices are affected by industry distress in piecemeal liquidations only, carries over to the single-equation specification in Table 6.

The WLS estimates show that the correction term λ is statistically insignificant in both regressions. This means that correcting for self-selection of the auction outcome is not required and that the OLS estimates are unbiased. Thus, we maintain our earlier conclusions of a conditional fire-sale effect in piecemeal liquidations but not in going-concern sales.

4 Auction prepacks and liquidation preemption

In theory, pervasive bidder illiquidity may eliminate the prospect of any going-concern bids in the auction, and cause excessive or inefficient liquidation of financially distressed but economically viable firms. As mentioned in the introduction, a major motivation behind the introduction of Chapter 11 was to reduce the risk of this happening relative to an auction-based system. Direct tests for the presence of excessive liquidation are difficult if not impossible to design. Below, we

[20] See Heckman (1979), Maddala (1983), and Li and Prabhala (2007).

examine this issue from the opposite angle: is there evidence that key parties to the bankrupt firm work to *preempt* excessive liquidation?

The idea pursued below is that auction prepacks anticipate and therefore preempt some liquidations. Prepacks are private workouts prior to filing, so they naturally respond to anticipations of excessive liquidation. Prepacks are also important in the auction system, as they constitute approximately one quarter of our continuation sales (53 cases, see Table 1). We first propose and test a price implication of the liquidation preemption hypothesis. We then present measures of post-bankruptcy performance in prepacks versus other going-concern sales as further evidence on the likelihood of liquidation preemption.

4.1 The liquidation preemption hypothesis

If market conditions create expectations of excessive liquidation in the bankruptcy auction, the bank lender may take action to prevent it. Once the firm has filed for bankruptcy, the auction eliminates the bank's bargaining power, and severe auction illiquidity may produce a price close to or at the piecemeal liquidation value. Anticipating this, it may be in the bank's best interest to initiate a voluntary workout involving sale of the target firm's operations followed by a prepackaged bankruptcy filing. Our predictions for auction prepacks are as follows:

> **H2 (Liquidation preemption hypothesis):** *A creditor anticipating inefficient liquidation due to auction illiquidity have an incentive to work out a continuation sale prior to bankruptcy filing—an auction prepack. Auction prepacks designed to preempt liquidation have prices that are higher than the piecemeal liquidation value but lower than prices in regular going-concern auctions. Prepacks are more likely to occur the more specific and intangible the target assets.*

Under H2, the prepack prevents a loss of the firm's going-concern value implied by inefficient piecemeal liquidation. Because some going-concern value is retained, the buyer accepts paying a price exceeding the expected piecemeal liquidation value in the auction. Moreover, because a prepack tends to occur in response to the threat of liquidation, the bidder's bargaining power is greater than normal, so average prepack prices are lower than in regular auction going-concern sales. As to the second part of H2, target asset specificity and intangibility generate rents that will be dissipated in a piecemeal liquidation. Given a high risk of liquidation, the greater the expected loss of rents the more likely we are to observe a prepack. We next turn to empirical tests of these predictions.

4.2 Price and recovery residuals in prepacks

Table 7 shows coefficient estimates in price- and recovery residual regressions for auction prepacks and salebacks. We single out salebacks along with prepacks because liquidation destroys private benefits of control, which in turn may prompt target insiders to support liquidation preemption (Strömberg, 2000). Notice first that the coefficient on $Distress * PL$ is negative and significant as before. The first regression in Panel A includes an indicator for prepack. It enters with a significantly negative coefficient of -0.52 (p-value of 0.00), suggesting lower prices in prepack sales. In separate regressions (not shown here), we include a dummy for non-prepack going-concern sales in our fundamental pricing regression (Table 2). This dummy receives a significantly positive coefficient, while the coefficient for PL still is negative and significant. This means that average prices in prepacks are lower than in other going-concern sales but higher than in piecemeal liquidations, as predicted by our liquidation preemption hypothesis.

The second regression in Table 7 adds the indicator variable *Saleback*, which is insignificant. In the third regression, we replace the indicators for prepack and saleback with indicators for the non-overlapping subsamples $Prepack * Saleback$, $Prepack * Nonsaleback$ and $Nonprepack * Saleback$. The average price-residual in the subsample of prepack-salebacks is strong and negative, with a coefficient value of -0.73 and a p-value of 0.00. The subsample of prepack-nonsalebacks also show a negative coefficient, significant at the 5 percent level. The average price-residual is, however, insignificantly different from zero for salebacks that take place in the regular auction: the coefficient for $Nonprepack * saleback$ is -0.17 with a p-value of 0.30. In sum, prepacks produce negative price residuals on average, and more so when the prepack is also a saleback. Salebacks, however, have no significant price-residuals when occurring in the regular auction. It is the private workout that matters, not the saleback transaction in of itself.[21]

Turning to debt recovery rates, in Panel B of Table 7, none of the coefficients involving prepacks

[21] We also examine the effect of industry distress in the subsamples of prepacks and salebacks, using the structure of Eq. (3). The results show that the price-residuals in prepacks, salebacks, non-prepacks, and non-salebacks do not interact with $Ind\ Distress$.

or salebacks are significant. Thus, while prepacks on average produce lower prices, this category does not affect total debt recovery rates. This is as expected if the bank promotes the prepack mechanism over piecemeal liquidation only when it is advantageous to do so. Consistent with this self-selection argument, rerunning the regressions in Panel B with the bank's own recovery rate (instead of the total debt recovery rate) yields results that are indistinguishable from those reported in Panel B (available upon request). That is, the bank's recovery in prepacks is statistically similar to that of non-prepack continuation sales.

4.3 Prepack and saleback probabilities

We next examine the determinants of the prepack and saleback decisions. Hypothesis H2 further predicts that prepacks are more likely to occur the more specific and intangible the target assets. Table 8 reports the total derivative with respect to each regression variable (as in Table 5). Consistent with H2, Panel A shows that the prepack probability increases with firm size, asset specificity, and asset intangibility. Notice also that there is no effect of industry liquidity conditions on the prepack probability. This suggests that fundamental target asset characteristics—not industry conditions per se—drives the basic prepack decision.

Target liquidation eliminates private benefits, if any, of target insiders.While a value-maximizing creditor has an incentive to preempt inefficient liquidation, target insiders may be willing to pay to continue the target as a going-concern even when liquidation is efficient—up to the value of the private benefits. This is consistent with our observation that salebacks occur in both regular auctions and prepacks. We expect the probability of a saleback to have some of the same determinants as the prepack probability. This is confirmed by the multinomial logit estimates in Panel B of Table 8. As for prepacks, the saleback probability increases with target asset specificity and intangibility. In addition, there is a positive impact on the saleback probability of the recent change in the business cycle.

The greatest impact on the saleback probability comes from the two industry distress indicators. *Ind Distress* has a large and positive coefficient, a result also documented by Strömberg (2000). However, this coefficient is to a large extent countered by a negative impact of *Ind Leverage*. The net effect is difficult to interpret. As argued by Strömberg (2000), it is possible that salebacks are designed to avoid auction illiquidity during industry-wide distress (thus the positive effect of

Ind Distress). On the other hand, the negative and offsetting effect of *Ind Leverage* may suggest that the target owner's incentive to invest is severely attenuated in periods with substantial industry debt overhang.

5 Post-bankruptcy performance

To the extent that auction prepacks are attempts to avoid piecemeal liquidation, successful restructuring of the target may be relatively difficult. If so, we would expect to see poorer post-bankruptcy performance for targets in such transactions. Similarly, if industry outsiders bring fewer managerial skills to the table than do industry insiders (as presumed under the fire-sale hypothesis), then the inferior managerial quality may also result in sub-par post-bankruptcy performance.[22]

Eckbo and Thorburn (2003) conclude that firms restructured under Swedish bankruptcy auctions overall have a post-bankruptcy operating performance at par with that of non-bankrupt industry rivals. Because the sample firms are all private, they use operating profitability and bankruptcy refiling rates to indicate the economic viability of the firms' operations. Here, we use the same performance metrics but focus on the performance of our subsamples of auction prepacks and sales to industry outsiders.

Post-bankruptcy performance estimation requires the identity of the newly restructured firm. We have this information in the first year after bankruptcy ("year 1") for a total of 150 of our targets sold as going-concern, which is the sample we use to compute cumulative refiling probabilities. Within this subsample, post-bankruptcy financial statements are available for a total of 106 firms in year 1. Table 9 reports annual industry-adjusted operating profitability (EBITDA/sales) in Panel A, book value of total debt to total assets in Panel B, and cumulative bankruptcy refiling probabilities (Panel C) for four years following the bankruptcy auction. Panels A and B report the median industry-adjusted value, computed as the difference between the firm and its median industry rival, where a rival is a firm with at least 20 employees in the same four-digit SIC industry as the target.

Using a Wilcoxon signed-rank test, the median industry-adjusted operating profitability is sta-

[22]Studies of Chapter 11 show that post-bankruptcy operating cash flows tend to be below industry standards, suggesting inefficient restructurings (Hotchkiss, 1995; Alderson and Betker, 1995; Chang and Schoar, 2006). One reason for the apparent inefficiency may be inferior quality of managers retained through the Chapter 11 process.

tistically indistinguishable from zero for the first three years following bankruptcy. Moreover, the p-values for the difference between prepacks and non-prepacks, and outsiders versus insiders, are all high. We conclude that the post-bankruptcy operating performance of auctioned targets is indistinguishable from the corresponding performance of industry rivals, and that it is unaffected by whether the filing is a prepack or whether the buyer is an industry outsider.

Panel B shows that targets in prepacks as well as non-prepacks have post-bankruptcy leverage ratios that are significantly higher than that of industry peers in years 1 and 2. There is no difference in the use of leverage in prepacks versus non-prepack acquisitions, however. Targets that are acquired by industry insiders (but not outsiders) have significantly higher leverage ratios than rivals in all four years shown in the table. Moreover, inside buyers show a greater reliance on leverage than outside buyers in years 3 and 4 (with p-values for the difference in those years of 0.03 and 0.00, respectively).

Panel C shows the difference between the bankruptcy refiling rates of our auctioned targets and the industry-weighted bankruptcy filing rate. Interestingly, targets in prepacks have a significantly greater industry-adjusted refiling probability than targets in non-prepack going concern sales. By year 4, the cumulative industry-adjusted refiling rate is 35% for prepacks compared to 8% for non-prepack targets. In contrast, targets where the buyer in the auction was an industry outsider on average refiles for bankruptcy at a rate that is statistically indistinguishable from the refiling rate of targets purchased by industry insiders (4% versus 18% by year 4, with a p-value of 0.24 for the difference).

Intrigued by the relatively low average refiling rate when the buyer is an industry outsider, we estimate the probability of bankruptcy refiling within two years of the auction. Table 10 shows the coefficient estimates in the logit-regressions. In the first regression, the refiling probability is shown to increase with asset specificity, but is independent of the target size and asset tangibility at the time of the auction. Moreover, targets that are auctioned during a business cycle upturn are less likely to refile. The two industry distress variables, $Ind\ Distress$ and $Ind\ Leverage$, have significant but opposite effects, with industry distress lowering the probability and industry leverage increasing the probability. Our fire-sale discount estimate has no impact on the refiling probability: the coefficient on the price residual $p - p^*$ is statistically insignificant. A consistent interpretation is that the fire-sale discount is economically unimportant (as concluded above), or that a fire-sale discount, if present, does not affect the quality of the restructuring of the target.

In the second regression of Table 10, we have added the binary variables *Prepack* and *Outsider*. Being a prepack target significantly increases the refiling probability, while a target acquired by an industry outsider has a significantly lower probability of refiling within two years of the auction. Both results are interesting. Consistent with our liquidation preemption hypothesis H2, prepacks appear to be more risky than non-prepacks in terms of the chance of having to refile within several years after the auction. This makes intuitive sense if "rescuing" a target from inefficient liquidation involves a relatively complex restructuring. As to the lower refiling probability for industry outsiders, it may reflect a selection of less risky targets or the presumption that industry outsiders are less efficient buyers may be wrong. The latter interpretation is consistent with the evidence above that outsiders pay no lower auction prices than do insiders, and they show no lower post-bankruptcy operating performance.

6 Conclusions

Proponents of a renegotiation-based bankruptcy system such as Chapter 11 argue that the alternative auction mechanism carries an unacceptable risk of fire-sale and excessive liquidation. Sweden's system of automatic bankruptcy auctions represents an interesting setting for testing this argument as there are no effective provisions for renegotiations under court supervision. The auctions are mandatory for all filing firms, standardized in form, and the seller has little or no influence over the outcome. The bids alone determine whether the firm will be continued as a going concern or liquidated piecemeal. A creditor concerned with auction illiquidity leading to excessive liquidation must take preventative measures by means of a private workout (before filing). Private workouts are target acquisition agreements that are submitted along with the bankruptcy filing (prepack auction).

We study prices, debt recovery rates, acquisition mechanisms, and post-bankruptcy performance across the entire range of auction outcomes in this system. The bankrupt firms are all private and with an average pre-filing asset size close to the average size of private firms filing for Chapter 11. We specify a fundamental pricing model based on target asset characteristics and test whether final auction prices deviate from fundamentals during periods of severe industry distress. Conditional on the fundamentals, significantly lower auction prices during periods of industry-wide illiquidity are considered evidence of fire-sale discounts. Thus, our tests of fire-sales discounts are joint tests of the fundamental pricing model and the hypothesized pricing effects of temporary demand-side illiquidity.

A key—and perhaps surprising—finding is that fire-sale discounts exist *only* when the auction leads to piecemeal liquidation of the target (the outcome in one-fifth of our sample auctions). Prices in going-concern sales are unaffect by measures of industry-wide illiquidity and distress. For piecemeal liquidations, however, higher industry-wide financial distress lowers both prices and debt recovery rates. This result is robust to endogenous selection of the auction outcome by bidders in the auction. Moreover, our finding of a fire-sale discount for piecemeal liquidations is comparable to studies of voluntary assets sales by U.S. companies both in and out of bankruptcy.

It appears that auctions where the buyer continues the target as a going concern are sufficiently competitive to yield prices that are indistinguishable from fundamentals. In going-concern sales, there are typically multiple bids, and there is no evidence that prices or recovery rates interact with measures of industry-wide distress, or with the industry-affiliation of the buyer (outsider versus insider)—two central indicators of fire-sale conditions used in the extant literature. We further show that bidders make frequent use of a leveraged buyout acquisition method which likely increases competition. Buyouts relax liquidity constraints and reduce bidder underinvestment incentives in the presence of industry-wide debt overhang. Possibly as a result, buyout prices are indistinguishable from prices in mergers, the alternative acquisition method.

We also argue that auction prepacks play an important role as a mechanism to preempt excessive liquidation when the auction is expected to be illiquid. There is substantial evidence to support this proposition. Prepack prices are somewhat higher than in piecemeal liquidations but lower than in regular, in-auction going-concern sales. The industry-adjusted post-bankruptcy operating performance of prepacks is on average similar to non-prepack going-concern sales. However, prepack targets have a significantly greater probability of refiling for bankruptcy after the auction. Thus, liquidation preemption appears to be a relatively risky strategy. Overall, as prepacks constitute 25% of our going-concern sample, the automatic auction mechanism produces substantial activity to avoid excessive liquidation.

We have shown in this paper that the Swedish automatic auction bankruptcy system works particularly well when the bankrupt firm is purchased as a going concern. There is no systematic evidence of fire-sales nor excessive liquidation. An interesting issue for future research is whether automatic auctions would also work well in the context of U.S. bankruptcies. It is possible that mandatory auctions are particularly well suited for the unique legal and corporate governance tradition in Sweden. On the other hand, as mentioned in the introduction, U.S. capital markets have moved in the direction of what Baird and Rasmussen (2003) characterize as "auction mechanisms in one form or another" also for large bankruptcies. This trend is likely to continue if auctions are in fact able to resolve the often complex corporate capital structures observed in the U.S.—something that the Swedish experience does not address.

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Figure 1
Frequency distributions of the number of interested bidders and actual bids in automatic bankruptcy auctions.

The average number of interested and actual bidders are 5.5 and 3.5, respectively. Sample of Swedish firms filing for bankruptcy, 1988-1991, and sold as going-concerns in the bankruptcy auction (excluding auction prepacks).

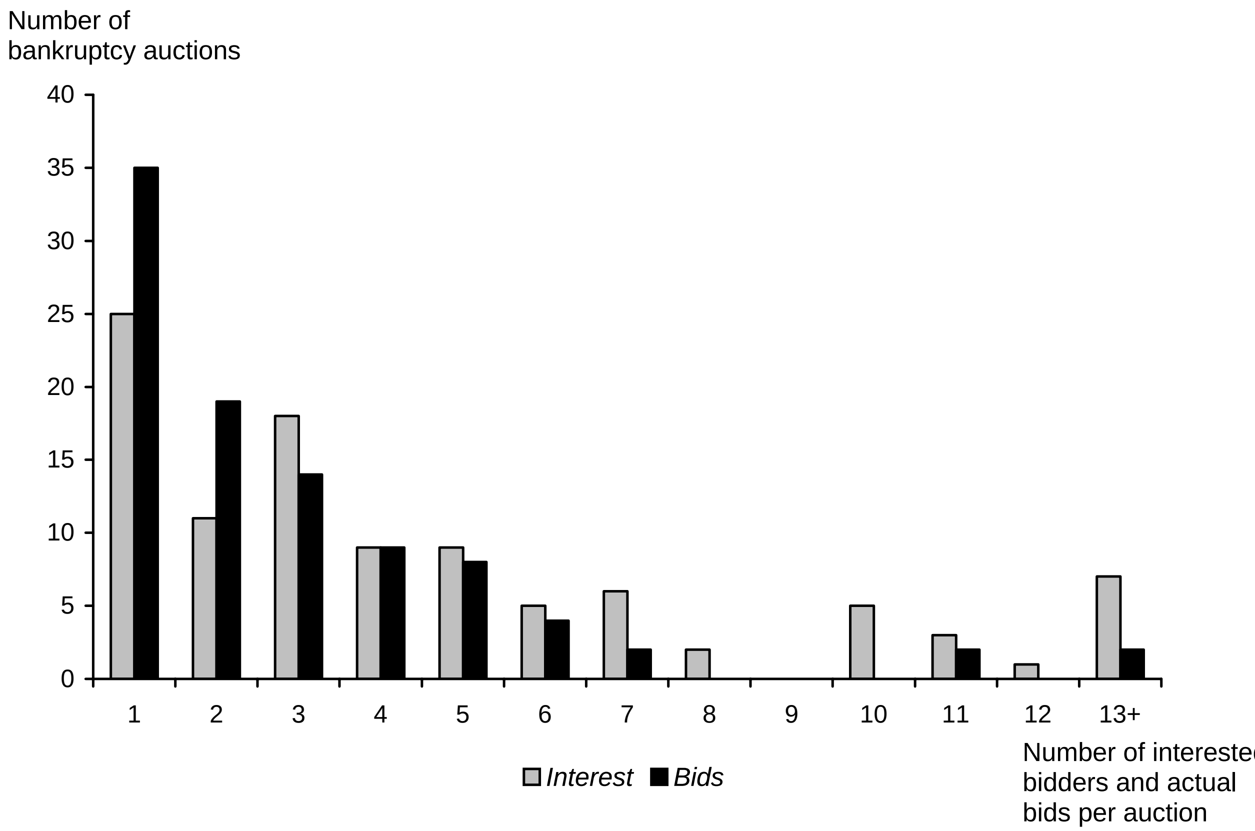

Table 1
Sample characteristics and variable definitions for automatic bankruptcy auctions

The sample contains 258 auctions from January 1988 to December 1991. "GC" and "PL" indicate going-concern sale and piecemeal liquidation, respectively. Financial information and book values are either "at filing" (from the bankruptcy case file), or "last reported" (from the most recent financial statement prior to bankruptcy filing, dated on average 16 months earlier). The target industry is defined using the 4-digit industry of the target, and requires a firm to have at least 20 employees. All industry information is for the year of the bankruptcy filing.

Variable	Definition	All Mean	GC Mean	PL Mean
N	Sample size	258	200	58
A. Target asset characteristics				
$Size$	Log(book value of assets), last reported[a]	2.30	2.33	2.23
$Asset\ sales$	Indicator for asset sales within two years prior to filing, trustee's file	0.26	0.28	0.19
$Profit$	Operating profitability: EBITDA/sales, last reported	-0.00	0.00	-0.02
$Specific$	Book value of (machinery and equipment)/(total assets), last reported	0.15	0.16	0.12
$Intangible$	Fraction intangible assets: (unsecured debt)/(total debt), at filing	0.61	0.62	0.58
B. Industry liquidity conditions				
$Ind\ Profit$	Median industry firm operating profitability: EBITDA/sales	0.05	0.05	0.05
$Bus\ Cycle$	Change in a quarterly, composite business cycle index[b]	-0.48	-0.33	-0.93
$Ind\ Distress$	Fraction of industry firms reporting an interest coverage ratio < 1 or file for bankruptcy the following year[c]	0.34	0.34	0.32
$Ind\ Leverage$	Median industry firm leverage: book value of debt/assets	0.78	0.78	0.80
$No\ of\ firms$	Number of firms in the industry	267	268	262
C. Auction outcomes				
PL	Indicator for piecemeal liquidation of the target	0.22		
GC	Indicator for going-concern sales	0.78		
$Outsider$	Indicator for going-concern buyer being a target industry outsider.[d]		0.26	
$Buyout$	Indicator for going-concern buyer using the buyout method (vs. merger)		0.71[e]	
$Prepack$	Indicator for going-concern buyer agreeing to acquire target pre-filing	0.21	0.27	
$Saleback$	Indicator for going-concern buyer being a former target owner		0.63[f]	
$Recovery$	Debt recovery rate: (net auction revenue)/(total face value of debt)[g]	0.35	0.37	0.26

[a]For illustration, the numbers reported in this row are in USD mill. (not the logarithm)

[b]The change is from the quarter prior to the quarter of the bankruptcy filing. The index is composed of the gross national product (+), producer price index (+), aggregate consumption (+), unemployment rate (-) and number of corporate bankruptcy filings (-). The variables are normalized with their respective mean and standard deviation before entering the index with equal weight and the sign indicated in parenthesis.

[c]Interest coverage ratio = (EBITDA+interest income)/(interest expense).

[d]We define insider sales are cases where the buyer (i) has the same 3-digit SIC code as the sample firm; (ii) is identified as a competitor of the sample firm; or (iii) is a former owner or employee of the bankrupt firm.

[e]The *Buyout* variable is identified for a total of 146 continuation sales, so 71% is 104/146.

[f]The *Saleback* variable is identified for a total of 193 continuation sales, so 63% is 122/193.

[g]Net auction revenue is the total proceeds from bankruptcy minus cost of the trustee's services.

Table 2

Estimation of the fundamental auction price (p^*) and auction debt recovery rate (r^*)

The cross-sectional regression models in Panel A and Panel B are, respectively, $p = \beta_{1p}X_1 + \epsilon_{1p}$ and $r = \beta_{1r}X_1 + \epsilon_{1r}$, where $p \equiv ln(P)$, P is the total proceeds from the bankruptcy proceeding, and r is the debt recovery rate ($r = (P - C)/D \in [0,1]$, where D is the face value of the target's debt and C is the direct costs of the bankruptcy proceedings). The fundamental auction price is defined as $p^* \equiv \hat{\beta}_{1p}X_1$, and the fundamental recovery rate is $r^* \equiv \hat{\beta}_{1r}X_1$. The table shows the OLS coefficient estimates $\hat{\beta}_{1p}$ and $\hat{\beta}_{1r}$. Total sample of 258 Swedish firms filing for auction bankruptcy 1988-1991. Variable definitions for the regressors in X_1 are given in Table 1 (p-values in parentheses).

	Target asset characteristics									Industry conditions			
Constant	*Size*	*Asset sales*	*Profit*	*Profit* *GC	*Profit* *PL	*Specific* *GC	*Specific* *PL	*Intangible*	*PL*	*Ind Profit*	*Bus Cycle*	Adjusted R^2	F-value
A. Auction price regressions													
5.44	0.67	-0.56	-0.46			-0.86	1.77	-1.61	-1.06			0.50	37.51
(0.000)	(0.000)	(0.000)	(0.309)			(0.048)	(0.055)	(0.000)	(0.000)				(0.000)
5.56	0.66	-0.56	-0.47			-0.91	1.67	-1.64	-1.07	1.99	-0.02	0.50	29.22
(0.000)	(0.000)	(0.000)	(0.295)			(0.078)	(0.039)	(0.000)	(0.000)	(0.433)	(0.435)		(0.000)
B. Auction recovery rate regressions													
0.73	-0.01	-0.04		0.30	-0.25	-0.09	0.28	-0.29	-0.18			0.18	8.22
(0.001)	(0.461)	(0.121)		(0.020)	(0.031)	(0.303)	(0.123)	(0.000)	(0.000)				(0.000)
0.76	-0.01	-0.04		0.25	-0.22	-0.10	0.20	-0.30	-0.18	1.03	-0.00	0.19	7.18
(0.001)	(0.275)	(0.138)		(0.058)	(0.061)	(0.218)	(0.262)	(0.000)	(0.000)	(0.040)	(0.306)		(0.000)

Table 3
Determinants of auction price residuals $(p - p^*)$ and recovery rate residuals $(r - r^*)$

Coefficient estimates from OLS regressions of the standardized auction price residuals $p - p^*$ (Panel A) and total debt recovery rate residuals (Panel B). The standardized residuals are from the first regression models in Panels A and B of Table 2, respectively. The explanatory variables are defined in Table 1 (p-values are in parentheses).

	Industry liquidity conditions					**Auction outcomes**					
Con-stant	*Ind Distress*	*Distress *GC*	*Distress *PL*	*Ind Leverage*	*No of firms*	*PL*	*Out−sider*	*Buyout*	Adj. R^2	F-value	N
A. Auction price residual $(p - p^*)$											
1.07 (0.103)	-0.50 (0.286)			-0.95 (0.273)	-0.57 (0.067)				0.01	1.52 (0.196)	258
0.88 (0.181)		-0.04 (0.946)	-1.88 (0.033)	-0.91 (0.294)	-0.59 (0.055)	0.60 (0.091)			0.02	1.92 (0.092)	258
0.88 (0.181)		-0.07 (0.895)	-1.88 (0.033)	-0.86 (0.319)	-0.59 (0.056)	0.57 (0.118)	-0.10 (0.541)		0.01	1.66 (0.132)	258
0.56 (0.454)		0.12 (0.854)	-2.03 (0.020)	-0.29 (0.756)	-0.69 (0.051)	0.50 (0.211)	-0.11 (0.558)	-0.12 (0.489)	0.02	1.51 (0.167)	204
B. Auction recovery rate residual $(r - r^*)$											
0.97 (0.138)	-0.67 (0.158)			-0.88 (0.312)	-0.21 (0.495)				0.00	1.11 (0.350)	258
0.83 (0.209)		-0.32 (0.554)	-1.70 (0.054)	-0.84 (0.331)	-0.23 (0.456)	0.45 (0.207)			0.00	1.28 (0.272)	258
0.83 (0.209)		-0.35 (0.520)	-1.71 (0.053)	-0.81 (0.355)	-0.23 (0.461)	0.42 (0.247)	-0.08 (0.599)		0.00	1.11 (0.355)	258
0.31 (0.704)		-0.01 (0.985)	-1.76 (0.060)	-0.40 (0.694)	-0.18 (0.631)	0.63 (0.149)	-0.10 (0.631)	0.10 (0.583)	-0.01	0.69 (0.677)	204

Table 4

Tests for the impact of industry distress on price and recovery rate residuals conditional on buyer industry affiliation

The dependent variable in Panel A is the standardized auction price residuals $p - p^*$ from the first regression in Panel A of Table 2. In Panel B, the dependent variable is the standardized recovery rate residuals $r - r^*$ from the first regression model in Panel B of Table 2. *Insider* is the complement to *Outsider* in continuation sales, so that $Outsider + Insider + PL = 1$. All other variables are defined in Table 1 (p-values in parentheses).

	Industry liquidity conditions						Auction outcomes				
Constant	*Ind Distress*	*Distress *Outsider*	*Distress *Insider*	*Distress *PL*	*Ind Leverage*	*No of firms*	*Outsider*	*PL*	Adj. R^2	F-value	N
A. Tests for the impact on the auction price residual ($p - p^*$)											
1.15 (0.092)		1.17 (0.231)	-0.54 (0.381)	-1.84 (0.036)	-1.01 (0.249)	-0.56 (0.071)	-0.66 (0.102)	0.39 (0.301)	0.02	1.76 (0.096)	258
1.15 (0.092)	1.17 (0.231)		-1.72 (0.129)	-3.02 (0.018)	-1.01 (0.249)	-0.56 (0.071)	-0.66 (0.102)	0.39 (0.301)	0.02	1.76 (0.096)	258
B. Tests for the impact on the recovery rate residual ($r - r^*$)											
0.95 (0.165)		0.22 (0.826)	-0.56 (0.369)	-1.69 (0.056)	-0.87 (0.321)	-0.21 (0.491)	-0.34 (0.403)	0.34 (0.372)	0.00	1.02 (0.418)	258
0.95 (0.165)	0.22 (0.826)		-0.78 (0.493)	-1.91 (0.137)	-0.87 (0.321)	-0.21 (0.491)	-0.34 (0.403)	0.34 (0.372)	0.00	1.02 (0.418)	258

Table 5
Determinants of the probabilities of the going-concern (GC) and piecemeal liquidation (PL) outcomes

Panel A of the table reports the coefficients estimates γ in binomial logit regressions with explanatory variables Z for the probability π of a GC (versus PL). In panels B and C the GC outcome is split in two parts, industry Outsider or Insider in Panel B, and Buyout or Merger in Panel C. These two panels report the partial derivatives $\partial\pi_n/\partial z_k = \pi_n(\gamma_{nk} - \sum_{m=1}^{3}\gamma_{mk}\pi_m)$. where γ_{nk} is the parameter for the kth explanatory variable in the vector γ_n determining probability π_n. The characteristics vector Z is the same across panels. Sample of firms auctioned in Swedish bankruptcy, 1988-1991. Variable definitions are in Table 1 (p-values in parentheses).

		Target asset characteristics				Industry liquidity conditions					
Dependent Variable	Con- stant	*Size*	*Profit*	*Speci–fic*	*Intan–gible*	*Bus Cycle*	*Ind Distress*	*Ind Leverage*	*No of firms*	Probability at mean vector	N
A. Binomial parameter estimates (γ) for the probability π of GC versus PL											
	-0.15	0.20	0.76	1.99	1.31	0.11	1.99	-4.45	0.32		258
	(0.966)	(0.229)	(0.468)	(0.087)	(0.052)	(0.070)	(0.104)	(0.054)	(0.676)		(200 GC+ 58 PL)
	N=258, Log likelihood=260.3, χ^2=14.69, df=8 (p=0.065)										
B. Derivatives $\partial\pi/\partial Z$ for the probabilities of GC–Outsider, GC–Insider, and PL											
GC–Outsider	-0.02	-0.01	-0.13	-0.01	-0.07	-0.01	-0.23	0.30	0.05	0.210	53
	(0.971)	(0.605)	(0.470)	(0.947)	(0.548)	(0.487)	(0.246)	(0.442)	(0.682)		
GC–Insider	-0.11	0.05	0.28	0.34	0.29	0.03	0.58	-1.06	-0.00	0.578	147
	(0.884)	(0.166)	(0.254)	(0.106)	(0.038)	(0.036)	(0.023)	(0.027)	(0.990)		
PL	0.13	-0.03	-0.15	-0.33	-0.23	-0.02	-0.34	0.76	-0.05	0.212	58
	(0.827)	(0.220)	(0.388)	(0.082)	(0.043)	(0.059)	(0.091)	(0.046)	(0.694)		
	N=258, Log likelihood=-242.2, χ^2=21.85, df=16 (p=0.148)										
C. Derivatives $\partial\pi/\partial Z$ for the probabilities of GC–Buyout, GC–Merger, and PL											
GC–Buyout	-1.49	0.10	0.21	0.58	0.35	0.03	0.36	-0.62	0.37	0.516	104
	(0.085)	(0.015)	(0.454)	(0.017)	(0.049)	(0.018)	(0.227)	(0.251)	(0.052)		
GC–Merger	0.54	-0.03	-0.05	-0.17	0.01	-0.01	0.11	-0.10	-0.17	0.212	42
	(0.415)	(0.282)	(0.804)	(0.384)	(0.921)	(0.431)	(0.647)	(0.806)	(0.267)		
PL	0.94	-0.07	-0.16	-0.41	-0.36	-0.02	-0.47	0.72	-0.20	0.272	58
	(0.200)	(0.050)	(0.477)	(0.072)	(0.016)	(0.047)	(0.069)	(0.120)	(0.235)		
	N=204, Log likelihood=-195.5, χ^2=27.78, df=16 (p=0.034)										

Table 6

Tests for fire-sale discounts in auction prices and debt recovery rates with correction for self-selection of the auction outcome.

The right-hand side variables in this table combines the fundamental asset characteristics from Table 2 and the industry liquidity conditions from Table 3 in a single regression. In Panel A the dependent variable is the logarithm of the auction price (p), while in Panel B it is the debt recovery rate (r). The first regression in both panels shows coefficient estimates using OLS. The second regression is estimated using WLS, and it includes the term λ correcting for self-selection of the auction outcome, where $\lambda = \phi/\Phi$ if the auction outcome is a going-concern sale and $\lambda = -\phi/(1-\Phi)$ if piecemeal liquidation. ϕ and Φ are the standard normal density and cumulative distribution functions, respectively, evaluated at $\hat{\gamma}'Z$. $\hat{\gamma}'Z$ is the predicted value from a probit regression for the probability of going concern sale (versus piecemeal liquidation), where the explanatory variables Z are the same as in Panel A of Table 5. Total sample of 258 Swedish firms filing for auction bankruptcy 1988-1991. Variable definitions for the explanatory variables are in Table 1 (p-values in parentheses).

A. Dependent variable: logarithm of auction price (p)

	Fundamental price characteristics									Industry liquidity conditions						
Constant	*Size*	*Asset sales*	*Profit*		*Specific *GC*	*Specific *PL*	*Intan–gible*	*PL*	*Ind Profit*	*Bus Cycle*	*Distress *GC*	*Distress *PL*	*Ind Leverage*	*No of firms*	λ	Adj. R^2	F-value
6.90	0.66	-0.61	-0.33		-0.82	1.67	-1.53	-0.41	-1.88	-0.02	-0.16	-2.11	-1.25	-0.64		0.51	21.4
(0.000)	(0.000)	(0.000)	(0.466)		(0.076)	(0.079)	(0.000)	(0.301)	(0.540)	(0.392)	(0.792)	(0.024)	(0.221)	(0.049)			(0.000)
6.38	0.69	-0.60	-0.14		-0.50	2.25	-1.27	0.72	-1.96		0.22	-1.63	-2.12	-0.55	0.70	0.51	21.3
(0.000)	(0.000)	(0.000)	(0.766)		(0.360)	(0.042)	(0.001)	(0.521)	(0.525)		(0.744)	(0.102)	(0.116)	(0.096)	(0.294)		(0.000)

B. Dependent variable: debt recovery rate (r)

Constant	*Size*	*Asset sales*	*Profit *GC*	*Profit *PL*	*Specific *GC*	*Specific *PL*	*Intan–gible*	*PL*	*Ind Profit*	*Bus Cycle*	*Distress *GC*	*Distress *PL*	*Ind Leverage*	*No of firms*	λ	Adj. R^2	F-value
0.87	-0.01	-0.05	0.25	-0.19	-0.08	0.19	-0.29	-0.08	0.60	-0.01	-0.05	-0.34	-0.09	0.06		0.19	5.41
(0.003)	(0.292)	(0.096)	(0.055)	(0.117)	(0.349)	(0.301)	(0.000)	(0.299)	(0.320)	(0.232)	(0.637)	(0.065)	(0.638)	(0.623)			(0.000)
0.69	-0.00	-0.05	0.29	-0.12	0.00	0.34	-0.22	0.24	0.70		0.06	-0.19	-0.33	-0.01	0.20	0.20	5.68
(0.021)	(0.837)	(0.096)	(0.034)	(0.306)	(0.972)	(0.102)	(0.002)	(0.261)	(0.255)		(0.654)	(0.303)	(0.213)	(0.907)	(0.120)		(0.000)

Table 7
Determinants of auction price residuals $(p - p^*)$ and debt recovery residuals $(r - r^*)$ in prepacks and salebacks

The standardized residuals $p - p^*$ and $r - r^*$ are from the first regression models in Panel A and Panel B, respectively, reported in Table 2. The explanatory variables are defined in Table 1 (p-values are in parentheses).

	Industry liquidity conditions				Auction outcomes								
Con-stant	*Distress *GC*	*Distress *PL*	*Ind Leverage*	*No of firms*	*PL*	*Prepack*	*Saleback*	*Prepack *Saleback*	*Prepack *Nonsale*	*Nonprepack *Saleback*	Adj. R^2	F-value	N
A. Auction price residual $(p - p^*)$													
0.90	-0.09	-1.89	-0.74	-0.56	0.45	-0.52					0.06	3.55	258
(0.164)	(0.858)	(0.028)	(0.383)	(0.062)	(0.202)	(0.001)						(0.002)	
1.06	-0.14	-1.89	-0.77	-0.57	0.31	-0.56	-0.17				0.06	3.37	251
(0.112)	(0.794)	(0.030)	(0.375)	(0.066)	(0.392)	(0.001)	(0.232)					(0.002)	
1.06	-0.14	-1.89	-0.77	-0.57	0.31			-0.73	-0.56	-0.17	0.06	2.94	251
(0.113)	(0.795)	(0.030)	(0.377)	(0.066)	(0.401)			(0.001)	(0.041)	(0.296)		(0.004)	
B. Total recovery rate residual $(r - r^*)$													
0.83	-0.33	-1.71	-0.80	-0.22	0.41	-0.12					0.00	1.17	258
(0.207)	(0.537)	(0.053)	(0.355)	(0.470)	(0.251)	(0.433)						(0.323)	
0.99	-0.30	-1.70	-0.86	-0.23	0.29	-0.15	-0.18				0.01	1.27	251
(0.144)	(0.593)	(0.056)	(0.334)	(0.463)	(0.428)	(0.350)	(0.231)					(0.264)	
0.99	-0.28	-1.70	-0.88	-0.23	0.32			-0.35	-0.06	-0.15	0.00	1.13	251
(0.148)	(0.616)	(0.057)	(0.321)	(0.461)	(0.396)			(0.117)	(0.823)	(0.396)		(0.342)	

Table 8

Determinants of the probabilities of an auction prepack, a saleback, and a piecemeal liquidation

The probability π_n of the n'th auction outcome is assumed to be determined by the value of $\gamma_n' Z$ $(n = 1, 2, 3)$, where γ_n is the parameter vector and Z is a vector of characteristics. We estimate γ_n using multinomial logit, and the table reports estimated partial derivatives $\partial\pi_n/\partial z_k = \pi_n(\gamma_{nk} - \sum_{m=1}^{3} \gamma_{mk}\pi_m)$. where γ_{nk} is the parameter for the kth explanatory variable in Z. Sample of firms auctioned in Swedish bankruptcy, 1988-1991. Variable definitions are in Table 1 (p-values in parentheses).

		Target asset characteristics				Industry liquidity conditions					
Dependent Variable	Con-stant	*Size*	*Profit*	*Speci–fic*	*Intan–gible*	*Bus Cycle*	*Ind Distress*	*Ind Leverage*	*No of firms*	Probability at mean vector	N
A: The prepack decision											
Prepack	-1.37	0.06	0.09	0.33	0.29	-0.00	-0.08	0.13	0.05	0.192	53
	(0.014)	(0.029)	(0.644)	(0.021)	(0.008)	(0.702)	(0.671)	(0.733)	(0.694)		
Non-prepack	1.28	-0.02	0.03	-0.01	-0.08	0.02	0.41	-0.88	0.00	0.593	147
	(0.074)	(0.439)	(0.880)	(0.955)	(0.564)	(0.062)	(0.095)	(0.061)	(0.991)		
PL	0.09	-0.03	-0.13	-0.32	-0.22	-0.02	-0.33	0.75	-0.05	0.215	58
	(0.877)	(0.250)	(0.463)	(0.099)	(0.056)	(0.065)	(0.106)	(0.052)	(0.694)		
		N=258, Log likelihood=-238.3, χ^2=26.40, df=16 (p=0.049)									
B: The saleback decision											
Saleback	0.09	0.02	0.27	0.38	0.31	0.03	0.79	-1.06	0.10	0.488	122
	(0.902)	(0.511)	(0.309)	(0.075)	(0.039)	(0.019)	(0.003)	(0.032)	(0.527)		
Non-saleback	-0.26	0.01	-0.10	-0.04	-0.05	-0.01	-0.41	0.27	-0.04	0.293	71
	(0.697)	(0.715)	(0.622)	(0.828)	(0.674)	(0.344)	(0.080)	(0.544)	(0.768)		
PL	0.17	-0.03	-0.16	-0.34	-0.25	-0.02	-0.38	0.80	-0.06	0.219	58
	(0.783)	(0.217)	(0.364)	(0.084)	(0.030)	(0.063)	(0.068)	(0.042)	(0.640)		
		N=251, Log likelihood=-249.6, χ^2=26.10, df=16 (p=0.053)									

Table 9
Industry-adjusted post-bankruptcy operating performance and cumulative bankruptcy refiling rates for targets sold as going-concern, classified by filing method (prepack vs. non-prepack) and buyer industry affiliation (outsider vs. insider)

The table reports operating margin, debt ratios and cumlative refiling rates for bankrupt firms auctioned as going concerns. "Industry-adjusted" is the difference between the target firm's value and the corresponding median value in the target's 4-digit industry. "Year 1" is the first calendar year after auction bankruptcy, etc. Superscript ** (*) indicates that the sample median is different from the industry median at the 1% (5%) level, using a Wilcoxon signed ranks test. The p-value for the difference in industry-adjusted medians is from a 2-sided Mann-Whitney U-test and for the difference in cumulative refiling rates a 2-sided t-test. Variable definitions are in Table 1. Sample of 150 Swedish firms filing for auction bankruptcy and sold as going-concern during 1988-1991.

Year after bankruptcy:		1	2	3	4
Panel A: Industry-adjusted operating margin (ebitda/sales)					
Prepack	Median	0.01	-0.03	-0.02	0.00
	n	23	20	15	12
Nonprepack	Median	-0.01	-0.02	-0.00	0.02^{**}
	n	83	74	58	44
p-value of difference: prepack vs. nonprepack		(0.138)	(0.416)	(0.069)	(0.140)
Outsider	Median	0.01	-0.02	-0.00	0.05
	n	29	26	19	11
Insider	Median	-0.00	-0.02	-0.01	0.02^{*}
	n	77	68	54	45
p-value of difference: outsider vs. insider		(0.918)	(0.906)	(0.841)	(0.657)
Panel B: Industry-adjusted debt ratio (book value of debt/total assets)					
Prepack	Median	0.16^{**}	0.15^{**}	0.13	0.07
	n	23	21	15	12
Nonprepack	Median	0.11^{**}	0.08^{**}	0.08^{*}	0.05
	n	83	75	60	45
p-value of difference: prepack vs. nonprepack		(0.797)	(0.364)	(0.474)	(0.625)
Outsider	Median	0.10	0.04	-0.02	-0.16
	n	29	27	20	12
Insider	Median	0.12^{**}	0.12^{**}	0.11^{**}	0.07^{**}
	n	77	69	55	45
p-value of difference: outsider vs. insider		(0.280)	(0.119)	(0.033)	(0.004)
Panel C: Industry-adjusted cumulative bankruptcy refiling rate					
Prepack	n=39	0.17	0.33	0.34	0.35
Nonprepack	n=111	-0.01	0.08	0.10	0.08
p-value of difference: prepack v. nonprepack		(0.014)	(0.010)	(0.017)	(0.023)
Outsider	n=36	0.03	0.07	0.07	0.04
Insider	n=114	0.04	0.17	0.18	0.18
p-value of difference: outsider vs. insider		(0.862)	(0.230)	(0.230)	(0.236)

Table 10
Bankruptcy refiling probability for targets sold as going-concern

Coefficients in logit estimations of the probability that the surviving firm refiles for bankruptcy within 2 years of the auction. The sample is 150 Swedish firms sold as going-concern in auction bankruptcy 1988-1991. P-values are in parentheses. Variable definitions are in Table 1.

	Target asset characteristics				**Industry conditions**				**Auction outcomes**			
Constant	*Size*	*Profit*	*Specific*	*Intan–gible*	*Bus Cycle*	*Ind Distress*	*Ind Leverage*	$p - p^*$	*Outsider*	*Prepack*	Cox Snell R^2	Chi-square
-2.42 (0.628)	-0.14 (0.577)	0.43 (0.837)	2.83 (0.015)	-1.12 (0.260)	-0.22 (0.012)	-5.32 (0.003)	6.90 (0.022)	-0.06 (0.794)			0.14	22.96 (0.003)
-2.79 (0.599)	-0.14 (0.601)	-0.66 (0.778)	2.78 (0.037)	-1.15 (0.149)	-0.22 (0.017)	-6.25 (0.001)	8.00 (0.012)	0.02 (0.932)	-1.46 (0.016)	1.35 (0.007)	0.21	35.01 (0.000)