Do Market Prices Improve the Accuracy of Court Valuations in Chapter 11?

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Abstract

This paper shows that public dissemination of trading information for registered corporate bonds reduces valuation errors in Chapter 11 bankruptcy reorganizations by about half, virtually eliminating unintended wealth transfers between claimants. The impact of dissemination is significantly greater where alternative market-based indicators of firm valuation, such as accurate analyst estimates for the company's assets are lacking. We establish that the primary driver of our results is an increased reliance on market prices of bonds in setting the plan value. The results suggest that the transparency of market prices helps improve the distributional efficiency of Chapter 11 bankruptcy.

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[T]he valuation of an enterprise . . . is an exercise in educated guesswork. At worst it is not much more than crystal ball gazing. There are too many variables, too many moving pieces in the calculation of value . . . for the court to have great confidence that the result of the process will prove accurate in the future.

—Judge D. Michael Lynn, U.S. Bankruptcy Court for the Northern District of Texas

1. Introduction

One goal of an efficient bankruptcy procedure is to divide the reorganization pie optimally among various claimants (see, e.g., Aghion, Hart, and Moore (1992), Hart (2000)). In US Chapter 11 bankruptcy procedures, the court must place a hypothetical value on the reorganized firm and issue new securities to the different claimants based on that hypothetical value. However, there is considerable difficulty in placing an objective and reliable value on the reorganized company, particularly when pre-bankruptcy claims, such as outstanding bonds, are either not traded or the market prices of trades are not publicly available during the bankruptcy process. The matter is further complicated by claimholders' incentives to misstate the value of the reorganized company to the court (Gilson, Hotchkiss, and Ruback (2000)). Indeed, Butler (2003) finds that court-determined valuations of the newly-issued common stocks of reorganized companies often differ substantially from the market values of those stocks shortly after emergence from Chapter 11, suggesting the presence of large court valuation errors in Chapter 11, which affect recovery rates to different creditors. To the extent they are anticipated prior to bankruptcy, the valuation errors have the potential to increase ex-ante borrowing costs (Douglas, Gertner, and Picker (1994)) and distort incentives of creditors to monitor (Cornelli and Felli (1997)) and managers' incentives to invest (Bebchuk and Chang (1992)).[1]

To improve the distributional efficiency of Chapter 11, prior studies have suggested settling reorganization outcomes through the distribution of option-like securities to creditors (see, e.g., Bebchuk (1988, 2002) and Aghion et al. (1992)), the direct auction of a firm's assets following bankruptcy filing (see, e.g., Baird (1986) and Eckbo and Thorburn (2009)), or by the public listing of a small portion of newly-issued equity before emergence to serve as an efficient price signal of the true reorganization value (see, e.g., Roe (1983)). All of these policy prescriptions are based on the argument that capital markets are better equipped than alternatives, such as bargaining and judicial

[1] Structural debt pricing models often include expected costs of bankruptcy and deviations from strict absolute priority (see, e.g., Leland (1994)).

determination, to value a publicly listed debtor. However, there is no empirical study providing a comparison of these alternative valuation approaches.

In this paper, we provide evidence that an alternative market-based mechanism—adding transparent and verifiable transaction data for the debtor's bonds during the Chapter 11 process—substantially reduces the court valuation errors, virtually eliminating unintended wealth transfers between different claimants and thereby avoiding consequent violations of the absolute priority rule (APR).[2] We also present evidence that the dissemination of bond prices matters more for court valuation errors where there are fewer alternative market-based sources of information on firm value such as analyst following and outside bids for the company's assets. Finally, we show that dissemination matters considerably less where hedge funds receive a significant equity share in the reorganized company, consistent with the evidence in Jiang, Li, and Wang (2012) that the presence of hedge funds helps reduce distortions arising from conflicts of interest between the debtor and secured creditors.

The link between court misvaluation and distributional considerations can best be illustrated with an example. iPCS, Inc. filed for Chapter 11 bankruptcy on February 23, 2003. On July 9, 2004, the bankruptcy court confirmed iPCS' plan of reorganization. As a result of the reorganization, iPCS' senior secured credit facility was repaid in full in cash and terminated, and its senior discount notes were canceled and the holders received nine million shares of newly-issued common stock. Additionally, all of iPCS' subordinated claims were discharged, and all of its then existing capital stock was canceled. The court-determined value of newly-issued common stocks, stated in the final plan of reorganization, was $95 million, but on emergence from Chapter 11 market participants valued those stocks at roughly $330 million, reflecting a substantial court valuation error. The misvaluation had important implications for the recovery rates to junior and senior claimants. Because the plan value was relatively low compared with the total value of creditor claims, all the newly-issued common stocks were received by senior creditors, and none were given to junior creditors or pre-bankruptcy equityholders. Based on the market value of common stocks, post-emergence recovery rates for senior creditors' claims were 154% of their claim amount of $214 million allowed by the bankruptcy court. If the market value of the common stocks had been anticipated in the court plan, more than one-third of the newly-issued

[2] The absolute priority rule mandates that absent the consent of senior creditors, junior claimants are entitled to no bankruptcy distribution unless and until the senior creditors are paid in full.

common stocks or $116 million would have been given to junior claimants. This $116 million transfer of wealth from junior to senior claimants represents an unintended APR violation that results from the misvaluation.

Following the above example, we calculate misvaluation and wealth transfers between claimants for a sample of 86 publicly traded firms that emerged from Chapter 11 during 2001-2010. We define misvaluation as the difference between the hypothetical value of the newly-issued common stocks, listed in the court-approved plan of reorganization, and the market value of those stocks on emergence from Chapter 11 (in absolute value), scaled by the average of the two values. We focus our measures of misvaluation on newly issued common stocks, which account for approximately 65% of the plan enterprise value.

We begin by documenting substantial court misvaluations in our sample of Chapter 11 reorganizations. For example, we find that the average (median) court misvaluation of newly-issued common stocks in Chapter 11 reorganizations is 49.8% (33.1%). These findings closely mimic those of Butler (2003) that examines a sample of 97 Chapter 11 reorganizations during 1990-1997 and finds an average misvaluation of 44.5%. As illustrated in the iPCS example above, large misvaluations may result in inter-claimant wealth transfers.[3] We distinguish between intended deviations from strict absolute priority that are part of the consensual court plan of reorganization and unintended deviations that solely result from misvaluation. Past studies conflate these two sources of wealth transfers despite potentially different efficiency implications. In our sample, intended and unintended APR violations occur with similar frequency (in about 20% of the reorganizations). However, the average size of inter-claimant wealth transfers, scaled by the market value of newly-issued common stocks upon emergence, is substantially larger in unintended violations than in unintended violations (49.6% vs. 4.3%, respectively).

One explanation for large court misvaluations and resulting wealth transfers in Chapter 11 is the limited availability of market-based information guiding bankruptcy participants (Gilson et al. (2000)). The primary conjecture of this study is that public availability of bond prices is a powerful market-based measure of firm value because the outstanding amount of traded debt is a significant fraction of the

[3] Butler (2003) does not calculate wealth transfers between the different claimants consequent on misvaluations.

overall enterprise value of firms in Chapter 11 (e.g., 53% according to Demiroglu and James (2015)). Bond prices might be used to determine not only the fair value of their claims but also the implied market value of non-traded securities and other claims.[4] However, evaluating the true impact of the availability of market prices of debt on court misvaluation is affected by a selection problem where firms with publicly traded debt may be fundamentally different from those without such debt.

We address this selection problem by using the introduction of the Trade Reporting and Compliance Engine (TRACE) that publicly disseminates all over-the-counter (OTC) corporate bond transactions as a quasi-natural experiment. Before the introduction of TRACE dissemination, almost all corporate bonds were traded in opaque markets without publicly disseminated transaction information: only a limited set of institutional investors had access to trade quotes (or matrix prices) from a few large brokerage firms resulting in substantial uncertainty regarding fair bond prices. In July 2002, FINRA (formerly known as NASD) initiated a program that mandated timely reporting by dealers of all registered bond transactions which were then publicly disseminated through TRACE. While transaction data on all TRACE-eligible bonds have been collected by TRACE since July 1, 2002, dissemination of the data was implemented in phases with mostly actively traded, large investment grade bonds falling into the first wave in 2002, followed by smaller investment grade bonds in 2003, and ending with all registered bonds regardless of size or rating over the subsequent year and a half.[5] The phased dissemination was implemented to minimize disruption to corporate bond markets and assess the impact of transaction disclosure on market conditions within these markets. As discussed below, we use this staggered implementation to estimate the effect of dissemination on court misvaluations. Since the timing of dissemination was based on observable bond characteristics such as rating and original issue size, conditional on these factors, TRACE dissemination is likely to be independent of the difficulty in valuing the debtor in Chapter 11.

[4] For example, assuming absolute priority holds, senior unsecured bonds trading below par indicates that the secured creditors will likely be paid in full, whereas subordinated debt holders and old equityholders will likely receive little or no distribution in the reorganization plan. Also, the enterprise value of the debtor will likely be roughly equal to the par value of secured debt (plus accumulated interest) and the market value of unsecured debt.

[5] We provide a more complete description of the TRACE program in Section 2.

Past studies provide evidence that the introduction of TRACE dissemination has significantly reduced price dispersion, especially for high yield bonds, in part by diminishing information asymmetries and reducing the scope for manipulation (see, e.g., Asquith, Covert, and Pathak (2013), Bessembinder, Maxwell, and Venkataraman (2006), Goldstein, Hotchkiss, and Sirri (2007), Cici, Gibson, and Merrick (2011)). Bessembinder and Maxwell (2008) provide anecdotal evidence consistent with these findings: For example, a commentator from a fixed income research service (as quoted by Bravo (2003)) stated: "... before TRACE, it wouldn't be unheard of for a trader to use the fact that there was no way of verifying the information that he gave about where a bond was trading to his advantage..." Also, referring to the post-TRACE era, a fixed-income trader quoted in Vames (2003) stated: "You don't have to go to three or four different people to find out where something is trading... [W]hen you have access to TRACE information, you have a better idea where things are before you make your first call." Finally, a bond trader quoted in Laughlin (2005) stated: "... [M]any investors now think the real benefit of TRACE lies in knowing that they are not being raked over the coals."

While we are unaware of any study examining the effect of dissemination in the context of bankruptcy, anecdotal evidence suggests that dissemination plays an important role in Chapter 11 as well. For example, in his testimony before the American Bankruptcy Institute's Chapter 11 Reform Commission, Edward I. Altman notes that: "All parties involved can now continuously and clearly observe the market's assessment of the debtor's liabilities so as to determine whether to sell or retain their interests and those prices provide important benchmarks for negotiating... [E]nhanced price discovery, compared to pre-1990 experience, helped to provide a more liquid market for the debt as the debtor works its way through the restructuring."[6]

[6] While we have no systematic evidence on whether bankruptcy courts rely on market prices when determining the enterprise values of individual debtors, anecdotal evidence suggests that some courts pay attention to market prices. For example, in VFB LLC v. Campbell Soup Co., 482 F.3d 624 (3d Cir. 2007), the court accepted a valuation analysis based on market prices and explained that: "Absent some reason to distrust it, the market price is a more reliable measure of ... value than the subjective estimates of one or two expert witnesses." Similarly, in TOUSA, Inc., 422 B.R. 783 (Bankr. S.D. Fla. 2009), the court agreed to using market values of publicly traded debt and equity to calculate enterprise value and explained that "... the sum of the market values of a company's debt and equity is the textbook definition of enterprise value... [I]t is commonly accepted among valuation professionals... [T]he market price of the equity plus the market price of the debt is what it would cost investors to purchase

In our empirical analysis, we use the enhanced TRACE data set (released by FINRA in March 2010) that includes both disseminated and non-disseminated historical bond transactions starting from TRACE's initiation in July 2002. This data set allows us to compare, at a given point in time, court misvaluations for two groups of companies with publicly traded bonds, those with disseminated bond prices, and those without. Overall, using a sample of 62 firms with publicly traded bonds during the Chapter 11 process, we find that the average court misvaluation is 33% in the dissemination sample and 68.9% (more than double) in the non-dissemination sample; the difference is statistically significant at the 1% level.[7] When we control for observable factors correlated with the timing and likelihood of TRACE dissemination as well as the difficulty of valuing the debtor, we find that the difference between the two samples remains economically large and statistically significant. Finally, to ensure that outliers do not drive our results, we also estimate linear probability regressions examining the likelihood of large (i.e., above sample median) misvaluations and find that large misvaluations are significantly less likely for firms whose bond prices were disclosed via TRACE.

While we find that misvaluations are reduced by the public availability of bond prices, other indicators of firm value may (partially) substitute for dissemination. Indeed, we find that the reduction of court valuation errors due to TRACE disclosure is substantially greater for firms with fewer available market-based indicators of value; dissemination reduces valuation errors significantly more for smaller firms, firms covered by fewer stock analysts, and firms that were not subject to acquisition bids during Chapter 11. Moreover, we find that dissemination matters significantly less in bankruptcies where vulture funds obtain significant equity stakes in the reorganized company. This is consistent with the

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claims on all of the company's assets." Moreover, in Iridium Operating LLC, 373 B.R. 283 (Bankr. S.D.N.Y. 2007), the court explained that "... the public trading market constitutes an impartial gauge of investor confidence and remains the best and most unbiased measure of fair market value and, when available to the court, is the preferred standard of valuation." The court noted that it would need "...a substantial reason to depart from that standard ... that the value implied by an efficient market is not a trustworthy benchmark." Not all bankruptcy judges agree, however. For example, in Exide Techs., 303 B.R. 48 (Bankr. D. Del. 2003) and Mirant Corp., 331 B.R. 800 (Bankr. N.D. Tex. 2005), the courts refused valuations based on market prices and noted that the taint of a bankruptcy reduces the usefulness of post-petition trading prices of a debtor's securities as an indication of value, because markets tend to undervalue entities in bankruptcy.

[7] Since the misvaluations include only part of the newly issued securities, the misvaluation of the enterprise value is significantly smaller.

evidence in Jiang et al. (2012) that the presence of hedge funds as unsecured creditors reduces distortions arising from conflicts of interest between the debtor and secured creditors. While Gilson et al. (2000) find that the presence of vulture funds in the unsecured creditor class influences the court plan to systematically overvalue the firm, our results show that the presence of hedge funds does not lead to larger misvaluations on average.

Misvaluations are more significant if they lead to wealth transfers between different claimants. For example, Baird and Bernstein (2006) assert that the uncertainty in the valuation of the debtor in Chapter 11 bankruptcy proceedings presents a significant challenge in maintaining the priority structure of both debt and equity claims upon emergence from Chapter 11. We estimate that dissemination of bond transactions via TRACE reduces the frequency and average size (relative to market value of newly-issued common stocks on emergence) of unintended inter-claimant wealth transfers. In particular, we find that dissemination reduces the likelihood of an inter-claimant wealth transfer by 20.7% (significant at the 10% level) from 35.7% to 15.0%. Also, while the average size of inter-claimant wealth transfers in the disclosure sample is a mere 1.2%, the average size of transfers in the non-disclosure sample is 11.8%. The difference between the two groups is statistically significant at the 10% level and economically large. Overall, the evidence suggests that availability of bond prices reduces the likelihood and size of unintended inter-claimant wealth transfers and consequent deviations from APR.[8]

Finally, we investigate the channel through which dissemination affects court misvaluations. We examine three hypotheses: (i) firms with disseminated bonds are easier to value than firms with non-disseminated bonds because disseminated bonds have different firm characteristics (e.g., size, tangibility, cash flow uncertainty, and beta) than non-disseminated bonds (a selection story); (ii) dissemination reduces the underlying uncertainty, i.e., variance of returns, about the value of the debtors' assets by enhancing information aggregation in the bond market; and (iii) in their valuation of the debtor's assets, participants (i.e., the debtor, creditors, and the court) in the bankruptcy process

[8] In some cases, rights issues are made by the firm in Chapter 11 for the purpose of paying off a class of creditors such as a bank. The rights are often subscribed to by a private equity firm or vulture fund. In that event, the wealth transfer to the subscribing party may be viewed as a reward for risk taking rather than as an unintended deviation from absolute priority.

take more account of bond prices after dissemination in updating their forecasts of the value of the reorganized firm.

Bond returns in the pre-disclosure statement period reflect changes in expectations about the value of the assets and the distribution of claims against those assets to the different classes of creditors. While after the disclosure statement date, the returns solely reflect changes in expectations about a firm's asset value. This admits two joint tests that both provide support for the misvaluation results discussed earlier and allows us to distinguish between the above three hypotheses.

We first examine how bond prices react to the announcement of the disclosure statement for the final plan of reorganization, which reports the court-determined valuation of the debtor as well as the distributions made by the court to each claimholder. We find that the average absolute abnormal return on disseminated bonds during the ten trading days centered on the announcement date is about 50% lower than the return on non-disseminated bonds. The evidence suggests that court-determined recovery rates are closer to market prices for disseminated bonds than for non-disseminated bonds, consistent with hypothesis (iii).

We next examine how dissemination is related to the variance of daily bond returns in two separate time windows: (i) between the date of bankruptcy filing and the disclosure statement date; and (ii) between the disclosure statement date and the plan confirmation date. If selection is at play, or dissemination primarily acts through a reduction in asset value uncertainty hypotheses (i) and (ii) we should observe that the variance of returns is always lower for bonds in the dissemination bucket. However, if dissemination only acts through a change in reliance on market prices in developing plan values, then we should see a reduction in variance before the disclosure statement date but similar return volatility afterwards. Here, both hypotheses (1) and (2) suggest that return variance should be higher for non-disseminated bonds both before and after disclosure statement date, while (3) suggests that dissemination will only impact returns before the revelation of plan value. Our results are

consistent with hypothesis (iii): we find lower return variance for disseminated bonds leading up to the disclosure statement date, but similar variances thereafter.[9]

The paper makes three contributions to the literature. The principal contribution is that it provides an experiment examining how dissemination of market prices of bonds affects the accuracy of court valuations in Chapter 11. The results unequivocally show that dissemination significantly reduces court misvaluations, especially where alternative indicators of firm value are unavailable. The paper also examines the effect of misvaluations on wealth transfers between different claimants; while dissemination halves the size of misvaluations, it virtually eliminates wealth transfers between different claimants. Finally, the paper examines the role of hedge fund positions in fulcrum securities and its impact on the size of misvaluations and wealth transfers between different claimants. The paper closest to ours is the one by Gilson et al. (2000) which measures the size of misvaluations based upon management cash flow projections and the market value of securities on emergence. They recognize the importance of market prices to court valuations, but they provide no systematic evidence to show their causal impact as in our TRACE experiment. They also examine the impact of hedge funds on misvaluation and show that when hedge funds are junior creditors [and receive equity] the courts put a higher valuation on the debtor. We find the same result, but we also find that the presence of hedge funds sharply reduces the size of court misvaluations and the wealth transfers between different claimants.

The insights of this paper may be relevant beyond the Chapter 11 setting, for example, to EU bank resolution procedures, where haircuts of particular securities (such as bail-in bonds) are based upon

[9] There may be a reflexivity at play in our results: if dissemination prompts court participants to place more emphasis on bond prices when determining plan values and bond traders take note of this, then bond prices will reflect less uncertainty about these values. If lower volatility in bond prices then translates into more confidence about valuation by court participants, then a virtuous cycle of increased reliance on bond prices in deciding plan value ensues. Our event study and variance results can be interpreted as follows: when disseminated, bond prices do not change much around disclosure statement date because they have already been converging toward one another for some time. This cycle has the added effect of reducing return variance while certainty about eventual plan value increases. Importantly, once plan value is established, only uncertainty about underlying asset values and confirmation voting outcomes remain. We expect and find that dissemination is not a primary driver of these forms of uncertainty.

hypothetical valuations of the reorganized banks. Our results also have important asset pricing implications. In particular, even if court valuations are unbiased estimates of the true reorganization value (see Gilson et al. (2000)), the reduction in valuation uncertainty and unintended inter-claimant wealth transfers due to dissemination will reduce the option value of default and therefore reduce the offered yields on bonds.

The rest of the paper is organized as follows. Section 2 provides a brief overview of institutional background on dissemination of corporate bond transactions via TRACE. Section 3 presents our empirical design. Section 4 describes the data sources and estimation samples. Sections 5 presents the estimated effect of TRACE disclosure on court misvaluations. Finally, Section 7 concludes.

2. TRACE Dissemination of Bond Transactions

In the late 1990s, the SEC requested NASD to take steps to increase the transparency of the corporate debt markets. The idea, as explained by Asquith et al. (2013), was to (i) create a platform to assemble and disseminate information on all secondary market corporate bond trades, (ii) create a database of corporate bond transactions that would allow regulators to supervise the market activity, and (iii) establish a surveillance system that would enable detection of misconduct and enhance investor confidence.

Trade Reporting and Compliance Engine (TRACE) was introduced by the National Association of Securities Dealers (NASD) on July 1, 2002, to enhance price transparency and integrity in the over-the-counter (OTC) secondary corporate debt markets. The TRACE system assembles all OTC bond transactions facilitated by brokers and dealers registered with the NASD, and it publicly disseminates those transactions in real time.[10] Most U.S. dollar-denominated corporate debt securities registered with the Securities and Exchange Commission (SEC) are TRACE-eligible.

TRACE collected bond data from inception in July 2002; however, instead of disseminating price and volume data for all reported bond trades to public investors, NASD implemented the dissemination in

[10] As Asquith et al. (2013) explain, TRACE has replaced a preexisting platform, the Fixed Income Pricing System (FIPS) that was initiated in 1994 to distribute transaction data for approximately 50 high yield bonds.

phases. This allowed NASD to examine the impact of transparency on bond liquidity before introducing dissemination for high yield securities whose liquidity could be relatively more sensitive to changes in transaction transparency. Phase 1 implemented on July 1, 2002 involved dissemination of information for large (i.e., original issue size $1 billion or greater) investment grade bonds as well as 50 non-investment grade bonds that were disseminated under FIPS. In the first phase, NASD disseminated transaction information for approximately 520 bonds that satisfied the criteria for selection. Phase 2, initiated on March 3, 2003 and became fully implemented on April 14, 2003, expanded dissemination to include smaller investment grade bonds (i.e., original issue size between $100 million and $1 billion). By the time the second phase was completed, the number of disseminated bonds had increased to 4,650. Finally, phase 3, initiated on April 22, 2004, expanded dissemination to almost all corporate bonds. This last phase was completed on February 7, 2005 when real-time transaction and price data for 99% of corporate bond trades had become publicly available.[11]

In March 2010, FINRA released a data set, which includes both disseminated and non-disseminated historical bond transactions between July 1, 2002 and February 7, 2005. This data set allows us to collect prices of bonds which were not available at the time of the transaction and during the Chapter 11 proceedings. As a consequence, it allows us to measure court misvaluations for the two groups of companies with TRACE-eligible bonds, those with disseminated bond prices, and those without.

3. Empirical Design

Determining the impact of publicly available bond prices on court misvaluation appears to be a simple empirical exercise: construct a measure of misvaluation and estimate a regression to examine the sensitivity of misvaluation to the existence of publicly disclosed bond prices. However, potential selection issues hamper any causal interpretation of this regression. In particular, firms with publicly available pricing information might be endowed with other characteristics that improve (or reduce)

[11] For additional details on the TRACE, see Trace Fact Book 2005 at:
https://www.nra.org/sites/default/ les/AppSupportDoc/p017618.pdf

the court's ability to properly value the defaulted company, biasing the estimated coefficient of disclosure. Thus, we need an identification strategy to estimate the causal impact of bond price dissemination on court misvaluation.

The staggered implementation of TRACE dissemination provides our first series of tests. We identify companies with at least one registered bond that traded during the bankruptcy process and divide those companies into two groups based on whether their bond prices were publicly disseminated. As long as the dissemination decision is exogenous to the determination of plan value, the regression specified in Equation (1) appropriately identifies for this sample of firms the incremental impact of disclosure of bond prices on the misvaluation attached to newly-issued common stocks in the plan of reorganization.

$$MisVal_i = \alpha + \beta_1 Disclosed_i + \epsilon_i \quad (1)$$

Here, $MisVal$ is the absolute difference between the plan value and post-emergence market value of newly-issued common stocks, all divided by the average of the two values. We discuss this measure in greater detail in Section 4. $Disclosed$ is an indicator variable that equals one if the company had at least one bond whose prices were publicly disseminated via TRACE during Chapter 11.

One potential concern with Equation (1) is selection—firms with and without disclosure may be different in terms of characteristics that are related to the ease of accurately valuing a company in court. However, TRACE dissemination was based on a set of observable factors, primarily bond rating and original issue size. Thus, conditional on bond rating and size, dissemination is likely to be independent of the difficulty in valuing the firm.

The equation below includes a vector of control variables to account for the observable selection effects on dissemination:

$$MisVal_i = \alpha + \beta_1 Disclosed_i + \gamma X + \epsilon_i \quad (2)$$

Equation (2) includes a key set of control variables that were used by NASD to determine the timing of TRACE dissemination, namely credit rating, bond liquidity, year of the bankruptcy filing (or emergence), and plan duration. We also include an additional set of regressors, firm size, leverage, equity volatility, leverage, and analyst coverage, that might impact the ability of courts to accurately

estimate the true value of a defaulted company's assets. Conditional on these control variables, we expect β_1 to reflect the causal impact of dissemination on court misvaluation.

We also examine whether the availability of alternative market-based indicators of firm value partially substitutes for the availability of bond prices. In particular, we examine whether the effect of TRACE disclosure on court misvaluation is lower for bigger firms and firms with more analyst coverage by interacting the disclosed dummy with firm size and the number of stock analysts that cover the firm.

4. The Sample and Data

We obtain data on publicly traded US firms that led for Chapter 11 bankruptcy protection from the UCLA-LoPucki Bankruptcy Research Database (BRD). We focus on bankruptcies that satisfy the following criteria: (1) the firm files for Chapter 11 on or after January 1, 2001 and emerges from Chapter 11 as an independent publicly traded company prior to December 31, 2010; (2) information on pre-petition firm financial characteristics is available from Compustat fundamentals annual files; (3) information on the common stock prices of the firm in the year after emergence from Chapter 11 is available through either Compustat daily security files or CRSP daily stock files; (4) court valuation of newly-issued common stocks under the Chapter 11 plan of reorganization is available from the disclosure statement for the final confirmed reorganization plan or the first post-emergence 10-K filing of the company on EDGAR.

Using the remaining reorganizations, we construct two different samples. The first sample, used in our quasi-experimental analysis, consists of 52 Chapter 11 reorganizations of firms whose bonds were publicly traded during the Chapter 11 process. This sample is restricted to firms that emerge from Chapter 11 after the introduction of TRACE on July 1, 2002. Our source of bond trading information is the TRACE-enhanced database that includes both disseminated and non-disseminated historical corporate bond transactions since July 1, 2002. Using this database, we identified 33 reorganizations where the prices of the debtor's bonds were publicly disseminated during the bankruptcy process. In 27 of those cases, dissemination was initiated before the bankruptcy filing and in the remaining 6 cases

dissemination was initiated during the bankruptcy process.[12] In the remaining 19 cases, transactions in the debtor's bonds were recorded but were not publicly disseminated by TRACE—those transactions eventually became publicly available with the release, in March 2010, of the TRACE-enhance database that includes historical bond transactions.

The second sample, used in our DID analysis, includes reorganizations of firms both with and without publicly traded bonds. This sample includes 45 of the 52 reorganizations in the sample used in our quasi-experimental analysis in addition to 36 reorganizations of firms without publicly traded bonds in their capital structures. Seven firms with publicly traded bonds are not included in this sample, because they emerged from Chapter 11 on or before February 14, 2005 (the last day of the TRACE implementation window as well as the pre-treatment period) and transactions on their bonds were being disclosed via TRACE prior to the emergence date.

We measure court valuation errors using the following formula:

$$MisVal = \frac{|V_{court} - V_{market}|}{[(V_{court} + V_{market})/2]}$$

Here, V_{court} is the court-determined value of the reorganized company's newly-issued common stock. V_{market} is the average split- and issuance-adjusted market value of the stocks one calendar year after emergence from Chapter 11, discounted back to the emergence date using the return on the daily CRSP equal-weighted stock index over the same time horizon. When calculating $MisVal$, we do not rely on market values immediately after emergence from Chapter 11 since practitioners suggest that stock prices may be temporarily depressed after emergence due to selling pressures (see Gilson et al. (2000)). We normalize the absolute difference between V_{court} and V_{market} by the average of the two values (i) to bound our measure of misvaluation between zero and two, thus reducing the potential effect of outliers on our results; and (ii) to treat equally overvaluations and undervaluations associated with court vs. market value pairs.[13]

[12] Dissemination was initiated during Phase 1 of TRACE dissemination in 8 cases, during Phase 2 in 5 cases, during Phase 3 in 13 cases, and after the full implementation of TRACE in 7 cases.

[13] The second point is best illustrated with an example. Suppose Firm A has a court value of $40 million and market value of $60 million, and Firm B has a court value of $60 million and market value of $40 million. Misvaluation,

To examine whether misvaluation leads to deviations from strict absolute priority, we also collect information on the size (also referred to as the "allowed amount" in court documents) of each claim class as well as court-determined total values of cash, notes, and equity securities distributed to those classes in the final plan of reorganization. We distinguish between intended and unintended deviations from strict absolute priority. An intended deviation occurs when, in the plan of reorganization, a junior claim class receives distributions before the senior classes are fully paid off. In other words, intended deviations are wealth transfers from senior claimants to junior claimants as part of a consensual plan of reorganization. An unintended absolute priority deviation occurs when court undervaluation (overvaluation) of the newly-issued common stocks results in wealth transfers from junior to senior (senior to junior) claimants.

For example, consider a hypothetical Chapter 11 reorganization where both senior creditors and junior creditors both have allowed claims of $100. Suppose, for simplicity, that the bankruptcy court only distributes newly-issued common stocks to claimants (no cash, notes, or warrants are distributed). Suppose also that the court values the stocks at $125, and distributes 80% of the stocks to senior creditors, resulting in a 100% recovery rate for senior creditors. The remaining 20% of the stocks, after senior creditors are fully paid off, are distributed to junior claimants, consistent with the strict absolute priority rule. Suppose, however, that market participants value the stocks at $80 upon emergence from Chapter 11, indicating that the court significantly overvalued the stocks. Based on market values, senior creditors recover 64%, and junior creditors recover 16% of their allowed claims, reflecting a violation of the strict absolute priority rule since junior claimants received payments before senior claimants are fully paid off. The size of the court valuation error in this example is $45 (or 43.9% based on our misvaluation measure), and the size of wealth transfer from senior creditors to junior creditors due to court misvaluation is $16. In our empirical analysis, we scale the dollar amount of the wealth transfer (in

based on our measure, is 40% in both cases. Using instead the plan value in the denominator would lead to misvaluations of 50% and 33% for Firm A and Firm B, respectively.

absolute value) by the total market value of newly-issued common equity on the emergence date. Therefore, the size of unintended inter-claimant wealth transfer in the example is 20%.[14]

More generally, when calculating the size of unintended inter-claimant wealth transfers, we assume that no claimant's recovery can exceed 100%. When the court value exceeds (is less than) the post-emergence market value, we allocate the reduction (increase) in reorganization value in ascending (descending) priority order. We hold distributions of cash and notes constant and focus only on the distributional effects of common stock misvaluations. Note that court misvaluations do not always result in wealth transfers among claimants. For example, in the example above, had market participants valued the company's stocks at $150 on emergence (resulting in a $25 court undervaluation), there would have been no wealth transfer between junior creditors and senior creditors.

Section 6 analyzes the impact of dissemination on bond price movements throughout the bankruptcy process. These tests parallel the results in other sections but allow for an expanded sample because of the more limited scope of the tests. Here, the sample includes all firms that have publicly registered bonds that are captured by TRACE, are included in the Lopucki bankruptcy database, and have filed for default in the years up to and including 2005. In addition, we require that the firm has bond trades on more than 5 days throughout the bankruptcy process.

This larger sample includes 85 firms with 271 individual bond issues. We clean the TRACE pricing data using the method outlined in Asquith et al. (2013). With the cleaned data, we calculate a trade by trade return series excluding bond trades of less than $50,000.[15] From prices, we calculate the time t intermittent trading period return as $R_{i.t} = \frac{P_{i,t}}{P_{i,s}} - 1$, where *s* is the date of the last trade for issue *i*. From this issue level returns series, we are able to derive two key metrics. First we calculate the absolute

[14] Inter-claimant wealth transfers may also arise from court undervaluation of the newly-issued stocks. For example, in the hypothetical reorganization above, suppose the court values the new shares at $80, distributes all the new shares to senior creditors consistent with strict absolute priority (based on plan values), but upon emergence from bankruptcy market participants value the shares at $125. This would result in a $25 million wealth transfer from junior creditors to senior creditors based on market values (an unintended inter-claimant wealth transfer of 20% based on our measure).

[15] Bessembinder, Kahle, Maxwell, and Xu (2009) advocates using only institutional trades in event studies. We do so by focusing on larger lots. Our results are robust to altering the trade size cutoff between $25,000 and $100,000, though our sample size is reduced at higher cutoffs.

event period return around various bankruptcy dates—in particular the date on which the disclosure statement is released (that reveals the final plan of reorganization approved by the court but not yet voted on)[16] and, the date on which that plan is confirmed. Second we calculate the average daily return variance: $\frac{\sigma(R_i)}{\sqrt{T}}$ over any time period T.

One concern with any test centered around the examination of bond transactions is the liquidity conditions in the market for defaulted debt. The perception that bonds rarely trade in default probably stems from the fact that many individual issues do not trade or trade with low frequency. However, conditional on a minimum threshold for trading activity of 5 days throughout the bankruptcy process, both volume and turnover of defaulted bonds are quite high. In fact, we show that the average bankrupt bond trades 15% of the days in default but that these trading periods are heavily clustered with average volume throughout the bankruptcy process averaging upwards of 200% of the total amount outstanding.

5. Plan Value and Emergence Value

5.1. Univariate Results

Table 1 displays summary statistics for the sample of 62 Chapter 11 reorganizations used in our quasi-experimental analysis. In the table, we present the mean value of each variable separately for the firms whose bond prices were disseminated during the Chapter 11 process (column (2)); and the "non-disclosure sub-sample" which consists of 42 reorganizations where the debtor's bond prices were not disseminated (column (3)). We also present the results of two sample *t*-tests (based on pooled variances) that we use to examine the hypotheses that the population means are equal for the disclosure sample and the non-disclosure sample (column (4)).

Panel A displays summary statistics on the size of court misvaluations. As shown, in our overall sample, the average misvaluation is 57.3%, similar to the average misvaluation of 44.7% in Butler

[16] At the time of release, this plan is not yet confirmed so some uncertainty about whether the plan will garner the appropriate votes remains. In addition, the final plan is on occasion preceded by other plans that reveal at least partial information about the eventual court valuation of the firm.

(2003)'s sample of 97 Chapter 11 reorganizations during 1990-1997 of firms both with and without publicly traded bonds. In roughly two-thirds of the reorganizations in our overall sample misvaluation exceeds 25%, and in roughly one-fifth of the reorganizations, it exceeds 100%. Such large valuation errors raise significant concerns about the distributional efficiency of the Chapter 11 process (see, e.g., Bebchuk (1988, 2002)). We examine the distributional consequences of court misvaluations in detail below.

Our focus in Panel A is to test the hypothesis that the dissemination of bond prices during the Chapter 11 process reduces the average size of court misvaluations. Consistent with this hypothesis, we find that the average misvaluation of the disclosure sub-sample is less than half (33%) of that of the non-disclosure sub-sample (68.9%). This difference does not arise from outliers in the data: The difference between the median court misvaluation of the disclosure sub-sample (29.1%) and that of the non-disclosure sub-sample (56.1%) is also economically substantial (27.0%) and statistically significant (*p*-value=0.01) (not tabulated). In addition, relative to the non-disclosure sample, the disclosure sample has a substantially higher frequency of reorganizations with misvaluations below 25% (45.0% vs. 28.6%) and a significantly lower frequency of reorganizations with misvaluations above 100% (5% vs. 28.6%).

Dissemination reduces not just the average court misvaluation but also the standard deviation of court misvaluations. In particular, we find that the standard deviation of court misvaluations is significantly lower (*p*-value=0.046) in the disclosure sub-sample (36.3%) than in the non-disclosure sub-sample (45.9%) (not tabulated), suggesting that dissemination significantly improves the predictability of court (mis)valuations. Taken together, these results imply that disclosure decreases the expected probability and size of misvaluations. Such improvements in the accuracy of court hypothetical valuations directly influence the possibility of unintended wealth transfers between claimants in reorganization and therefore likely affect the ex-ante cost of capital for firms.

Misvaluation appears to lead to unintended wealth transfers. We find that unintended deviations from APR are significantly less common (a the 10% level) in the disclosure sub-sample (15%) than in the non-disclosure sub-sample (35.7%). Moreover, we find that the average size of inter-claimant-wealth transfers in unintended APR violations is significantly smaller in the disclosure sample (1.2% vs. 8.4%).

While the size of misvaluations in the disclosure sample remains significant, the consequent wealth transfers between the different claimants is tiny. In contrast, wealth transfers for the non-disclosure sample remain very large indeed.

To summarize, the univariate evidence in Table 1 provides strong support for the hypothesis that dissemination of bond prices reduces average court misvaluations as well as the size and the frequency of consequent unintended deviations from APR. In the next three subsections, we conduct multivariate tests to examine the robustness of these univariate findings. However, before turning to the multivariate tests, we examine whether there are systematic differences between the disclosure sample and the non-disclosure sub-sample based on bankruptcy and firm characteristics. As shown in Panels C and D of Table 1, we find that firms in the disclosure sub-sample are on average bigger, with a higher following by stock analysts, and they have higher bond liquidity than firms in the non-disclosure sample. We also find that firms in the disclosure sample are significantly more likely to file for Chapter 11 in Delaware or New York Southern District where the Chapter 11 process is faster. In our regressions, we control for these factors to identify the incremental effect of dissemination on court misvaluations and inter-claimant wealth transfers.

5.2. Base Regression Results

As discussed in Section 3.1, the introduction of TRACE provides a quasi-natural experiment to identify the effect of bond price transparency on court valuation accuracy. Our hypothesis is that dissemination reduces the size of court misvaluations. We test this hypothesis using Equation (1), a univariate regression specification, and Equation (2), a multivariate regression specification that controls for factors that are correlated with both the likelihood of dissemination and the severity of valuation uncertainty. The results are presented in Table 2.

Column (1) presents the estimates from Equation (1) where the dependent variable is misvaluation, the intercept shows the average misvaluation for the undisclosed group, and the coefficient of Disclosed dummy shows the estimated impact of disclosure on average court misvaluation. The estimates from this model are identical to the estimates based on mean comparison tests reported in Panel A of Table 1

and serve as baselines for our multivariate tests. As shown, before controlling for factors that may be correlated with both disclosure and misvaluation, dissemination substantially reduces court misvaluations by 35.9% (significant at the 1% level).

The dissemination dummy is correlated with the timing of the firm's bankruptcy reorganization. This is because our non-disclosure sub-sample consists of firms that emerge from Chapter 11 before TRACE dissemination was expanded to the universe of corporate firms in February 2005, whereas our disclosure sub-sample consists of firms that emerge from bankruptcy in any year during 2002 through 2010. If the year a firm enters into bankruptcy or emerges from bankruptcy is also correlated with the difficulty of valuing the firm (for example, due to variation in the business of bankruptcy courts (Iverson (2015)) or the nature of firms that reorganize, the specification presented in column (1) will suffer from an omitted variables bias. To address this concern, we estimate regressions with emergence year and filing year dummies, as shown in columns (2) and (3), and find that dissemination reduces court misvaluations by 41.6% and 28.7%, respectively (both estimates are statistically significant at the 1% level).[17]

As discussed in Section 2, during the TRACE implementation window, dissemination began earlier for large, highly rated, and actively traded bonds, and later for smaller, high yield, less liquid bonds. As a result, for firms that emerge from Chapter 11 before the full implementation of TRACE, whether the firm is included in our disclosure sub-sample or our non-disclosure sub-sample is determined by the characteristics of the firm's outstanding bonds (at the time dissemination decisions were made by

[17] In regressions with year fixed effects, identification of the coefficient estimate for the dissemination dummy comes from observations in years where there is some cross-sectional variation in dissemination. For example, calendar years 2003 and 2004 are the only years during our sample period in which some firms from both our disclosure sample and our non-disclosure sample emerged from bankruptcy: All the firms that emerged from Chapter 11 in calendar year 2002 are in our non-disclosure sample and all the firms that emerged during 2005-2010 are in our disclosure sample. As a result, in the model with emergence year dummies, identification of the coefficient for *Disclosure* comes from reorganizations completed in 2003 and 2004. 18 of our sample firms emerged from bankruptcy in 2003 or 2004. Six of those firms are in our disclosure sample and 12 are in our non-disclosure sample. Similarly, identification in the model with filing year fixed effects comes from the sub-sample of reorganizations that began in calendar years 2001, 2003, and 2004. Out of the 21 firms that led for Chapter 11 in 2001, 2003, or 2004, 11 firms are in our disclosure sample and 10 firms are in our non-disclosure sample.

NASD, and not at the time the court determined the firm's valuation). If those characteristics are also correlated with the difficulty of valuing the firm, dissemination could just serve as a proxy for omitted bond characteristics instead of having a causal impact on the size of court misvaluations. One way to address this concern is to control for the characteristics of the debtor's bonds in our regression models. However, NASD has not publicly disclosed how exactly it measured those characteristics and formulated its final dissemination decisions. More important, it is not obvious which time interval is most appropriate for measuring the liquidity and the credit rating of a debtor's bonds.

To overcome these empirical challenges, we employ an alternative estimation strategy.[18] In particular, we estimate a model where we substitute the disclosure dummy used in columns (1) to (3) with four dummy variables that indicate the phase in which the firm's bonds were publicly disseminated for the first time (the fourth dummy indicates that the dissemination was initiated after February 7, 2005). The idea here is to separate the causal effect of dissemination on court misvaluation from the effect of omitted bond characteristics, by comparing the coefficients of the dissemination phase dummies. For example, because bonds disseminated in Phase 1 and Phase 3 have different characteristics, differences in the coefficients of Phase 1 and Phase 3 dummies in our model will reflect the effect of those omitted bond characteristics on court misvaluations. If dissemination is indeed a proxy for omitted bond characteristics correlated with the difficulty of valuing a company, we would expect to find the coefficients of the dummy variables to be significantly different from one another. However, as shown in column (4) of Table 2, the coefficients of all four dummy variables are similar in magnitude; three of them are statistically significant at conventional significance levels, and the fourth coefficient (the coefficient of Phase 2 dummy), while not significant, has a *t*-statistic of 1.38. More important, when we formally test, for each pair of disclosure dummies, whether their coefficients are

[18] Though not tabulated, we estimated a model where we controlled for bond size (defined as the natural logarithm of the bond's par value at origination), bond liquidity (defined as the maximum quarterly average value of the percentage of days traded between July 1, 2002 and the date of emergence from Chapter 11), and bond rating (defined as the natural logarithm of the highest numerical bond rating for the firm between July 1, 2002 and the emergence date). Overall, we find that none of the bond characteristics is significantly related to the size of court misvaluation. Moreover, the size and significance of the disclosure dummy are not sensitive to the inclusion of the bond characteristics.

equal, we fail to reject equality at conventional significance levels. Overall, the evidence suggests that the dissemination dummy is not simply a proxy for omitted bond characteristics, or in other words, dissemination has an effect on court misvaluations that is independent of bond characteristics.

Finally, in columns (5) to (7), we provide evidence that the estimated effect of dissemination on court misvaluation is robust to controlling for industry dummies, firm characteristics, and bankruptcy characteristics. We also show that court misvaluations are significantly greater in reorganizations of smaller firms and firms with higher valuation uncertainty (as measured by post-emergence stock return volatility).

We conduct two sets of tests to check the robustness of the results in Table 2. To conserve space, we present the results of those tests in the online appendix and briefly summarize them here. First, we substitute our dependent variable, misvaluation, with a binary dependent variable that takes a value of one if court misvaluation exceeds the median misvaluation over the sample period (32%); and zero otherwise. This binary variable emphasizes large deviations that presumably matter most for potential inter-claimant wealth transfers while eliminating the possibility that one or two outliers are driving our results. Overall, we find that the likelihood of a large misvaluation is between 40.5% and 52.3% less likely for firms whose bond prices were disseminated via TRACE during the Chapter 11 process. Second, we estimate all the regressions in Table 2 after re-calculating our misvaluation measure (i) using the market values of common stocks 1-month, 3-months, and 6-months after the emergence date; (ii) using a discount rate based on the Capital Asset Pricing Model (CAPM), Fama-French Three-Factor Model (FF3), or Carhart's Four Factor Model (FF4); and (iii) discounting post-emergence market values to the plan confirmation date or the filing date of the disclosure statement. We find that the alternative measures of court misvaluation are very highly correlated and our results are not sensitive to which of the alternative measures we use.

To summarize, the evidence in Table 2 indicates that dissemination reduces court misvaluation by between 29.0% and 41.6% (depending on the specification), as compared to an average misvaluation of 68.9% in cases without dissemination. In the next subsection, we examine whether the reductions in court misvaluation result in reductions in the size and likelihood of inter-claimant wealth transfers.

5.3. Disclosure of Bond Prices and Unintended Deviations from Absolute Priority

As discussed in Section 4, court misvaluations will not always result in inter-claimant wealth transfers. For example, consider a hypothetical reorganization where a class of senior creditors with $100 million of allowed claims received common stocks in satisfaction of their claims. Suppose that the court valued the stocks at $50 million in the plan of reorganization, but the market value of the stocks on emergence was $80 million. In this case, the plan undervalues the common stocks by $30 million and underestimates the recovery rate to the senior claimants by 30%, but the valuation error does not result in a wealth transfer between the claimants of the debtor. Thus, while the results in Table 2 indicate that the dissemination of verifiable bond transaction information substantially reduces court misvaluations, this need not directly translate into improved allocative efficiency.

Table 3 presents our OLS estimates of the effect of dissemination on the size of unintended inter-claimant wealth transfers that arise from misvaluation of the common stocks distributed in the plan of reorganization. In our estimations, we use the same regression specifications as in Table 2. As shown, we find that dissemination reduces the wealth transfers by between 8.6% and 21.0% (significant at the 10% level in most specifications).[19]

Overall, the results in Tables 2 and 3 provide strong support for the hypothesis that the dissemination of bond prices during bankruptcy significantly improves the distributional efficiency of Chapter 11 reorganizations.

5.4. Cross-Sectional Variation in the effect of Dissemination on Misvaluations

In this section, we examine whether the availability of alternative sources of market-based information on firm value reduces the size of court misvaluations in Chapter 11 and attenuates the effect of TRACE dissemination on the size of court misvaluations. Table 4 presents our findings. Our models include a dummy variable indicating whether or not the reorganized firm is in our disclosure sub-sample, an information measure, and the interaction of these two variables. The coefficient of the

[19] Because of the low frequency of non-zero wealth transfers, to check the robustness of our findings, we also estimate left-censored Tobit models and find significant coefficients in all the specifications (not reported for brevity).

information measure shows how court misvaluation varies with this measure in our non-disclosure sub-sample. The coefficient of the interaction term shows how the effect of dissemination on court misvaluation varies with the information measure.

As shown in columns (1) to (2), conditional on non-dissemination, we find significantly higher court misvaluations in the firms lightly covered by analysts and with large analyst forecast errors prior to default. The evidence suggests that valuation uncertainty arising from the lack of information significantly increases the size of court misvaluations in Chapter 11. We also find that TRACE disclosure reduces court misvaluations significantly more for in the case of low analyst coverage and less when there is a large forecast error, suggesting that dissemination is most effective in reducing court misvaluations where alternative market-based indicators of firm value are limited or unavailable. Along similar lines, misvaluations are lower for firms with lower standard deviation of returns post emergence, but the effect of dissemination is highest for those firms with higher post emergence volatility. Firms that are harder to value as evidenced by the higher return volatility are more impacted by dissemination than easier to value firms.

Finally, we examine whether dissemination has a greater effect on court misvaluations where the debtor's bonds are not actively traded in the market during the Chapter 11 process. We consider a bond as actively traded if the bond is traded in 40% or more of the trading days throughout bankruptcy. As shown in column (5), for firms in our non-disseminated sample, we find that higher bond liquidity is associated with a 56% lower court misvaluations (significant at the 1% level), suggesting that, even when not publicly disseminated, prices of actively traded bonds may be helpful in reducing court misvaluations. We also find that dissemination reduces court misvaluations more where the debtor's bonds are less liquid, suggesting that the bene ts of dissemination are greater where uncertainties regarding fair bond prices are higher.

Overall, the results in Table 4 are consistent with the conjecture that the incremental benefit of disseminating bond prices in terms of reducing uncertainty in bankruptcy valuations is greatest when there is less information about the valuation of the debtor.

6. Plan Uncertainty and Bond Prices

In this section, we investigate three different (non-mutually exclusive) hypotheses that could help explain the inverse relationship between dissemination and court misvaluations: (i) firms with disseminated bonds are easier to value than firms with non-disseminated bonds because the two groups of firms have different characteristics (e.g., size, tangibility, cash flow uncertainty, and beta) (a selection story); (ii) dissemination reduces the underlying uncertainty about the value of the debtor's assets by enhancing information aggregation in the bond market; and (iii) in their valuation of the debtor's assets, participants in the bankruptcy process (i.e., the debtor, creditors, and the court) take more account of bond prices after dissemination when updating their forecasts of the value of the reorganized firm.

We test these hypotheses using daily bond price data throughout reorganization. Bond returns before the announcement of the court plan (or the disclosure statement date) mainly reflect changes in expectations both about the court adjudicated asset value and how the court plan distributes that value between the different claimants. After the court disclosure statement date, bond returns mainly reflect changes in expectations about a firm's asset value and no longer about the distribution of the proceeds between the claimants.[20] We conduct two different tests. First, we analyze the absolute bond returns around the disclosure statement date. Second, we compare the variance of bond returns before and after the release of the court disclosure statement.

Our first test does not distinguish between hypotheses (i)-(iii). A finding of reduced absolute returns around the disclosure statement date for disseminated bonds is a necessary condition for any of these three hypotheses. However, if either hypothesis (i) or (ii) are correct—that the increase in plan accuracy for disseminated bonds arises from lower asset value uncertainty due to either a selection effect or an increase in price efficiency from dissemination—then we should observe lower return volatility in both the pre-disclosure statement period when returns reflect both plan of reorganization and firm value uncertainty as well as the post-disclosure statement period when returns only reflect firm value uncertainty. If, on the other hand, we observe that dissemination reduces pre-disclosure uncertainty only and does not affect post-disclosure uncertainty, then the causal channel is consistent with

[20] To a smaller extent there is some uncertainty regarding confirmation of the plan even after the disclosure statement date.

hypothesis (iii)—that participants to the court plan reorganization update their estimates of asset valuation and its distribution to different claimants as a consequence of dissemination of market prices.

Table 7 presents the results of our first test. As shown in column (1), we find that dissemination reduces the average absolute cumulative bond returns during the ten trading days centered on the release of the court disclosure statement by about 10%. The effect of dissemination is robust to controlling for bond liquidity, size, seniority, security, and moneyness.[21] These results suggest that the gap between the market price (before the disclosure statement date) and court-determined recovery rate is smaller for disseminated bonds than for non-disseminated bonds. Cross-sectionally, we find that the difference is attenuated where valuation uncertainty is low (i.e., where the debtor is large or the plan of reorganization is ~~pre-~~negotiated).

Figure 1 illustrates graphically the path of average absolute difference between the bond price at various points in time during the reorganization process and the price at the disclosure date—$\left|log\left(\frac{P_{i,t}}{P_{i,d}}\right)\right|$ where $P_{i,t}$ is the price of bond *i* at time *t* and $P_{i,d}$ is the average price of issue *i* during the 10 days following the disclosure statement date, *d*. Along the Y-axis, Figure 1 displays the absolute log price differential, and along the X-axis we plot the percentage of the process remaining (divided into 5 percent windows) until the disclosure statement date. For example if the total time between filing date and disclosure statement date for firm ABC is 100 weeks, after 25 weeks, 75 weeks or 75% of the total time still remains, so the X-axis will read 75%. The blue dots represent disseminated bonds, and the red dots represent non-disseminated bonds. As shown, non-disseminated bonds are always priced farther away from the value at emergence than disseminated bonds. Logically, this distance collapses for both bonds as the disclosure statement is released, but the returns around this event are higher for non-disseminated bonds.

Table 8 displays the results of test (ii). In the table, we examine the variance of daily returns before and after the disclosure statement date separately for disseminated and non-disseminated bonds. As

[21] In some bankruptcies, the reorganization plan and the disclosure statement is amended several times. We examine only the disclosure statement for the final plan of reorganization. We recognize that some information may be revealed in previous versions of the plan. This introduces noise in our tests; however, we find no correlation between dissemination and the existence of a previous disclosure statement.

shown in Panel A, we find that dissemination is associated with a significantly lower variance of returns before the disclosure statement date; the coefficients on dissemination in columns (1) and (3) are negative and statistically significant. However, as shown in columns (2) and (4), we find no significant difference in the variance of returns of disseminated and non-disseminated bonds after the disclosure statement date. Put differently, in the period where prices reflect uncertainty about court-determined distributions as well as firm asset value, dissemination reduces uncertainty, but in the post period, where uncertainty about the court-adjudicated plan value is eliminated, there is no difference in the variance between the disseminated and non-disseminated bonds.

The results in this section suggest that for the post-disclosure statement date, dissemination does not impact the variance of returns, which means the ease with which the market values the firm's assets is similar for both disseminated and non-disseminated firms. This critically eliminates hypotheses (i) and (ii): that the firms with disseminated bonds are somehow easier to value than firms with non-disseminated bonds, or that dissemination reduces misvaluation through a reduction in asset value uncertainty.

7. Conclusion

Our paper investigates how transparency of market prices can reduce court valuation errors in Chapter 11 bankruptcy. While the efficiency of market prices during default is controversial within the judiciary, we find that an increase in the availability of market prices results in a significant reduction in the size of court misvaluations in Chapter 11. In our analysis, we take advantage of the TRACE dissemination program which provides a plausibly exogenous shock to the transparency of transaction prices for defaulted firms. We find a significant reduction in misvaluations for firms with disseminated bond prices, which largely eliminates wealth transfers between claimants and APR violations associated with valuation uncertainty. These findings strongly suggest that verifiable and transparent market prices act as a valuable source of information in Chapter 11.

Our paper has important policy implications in other settings where hypothetical valuations are used to determine asset recoveries such as in EU bank resolution procedures. Our results also have some important asset pricing implications. Even if court valuations are unbiased, the reduction in valuation

uncertainty due to dissemination will reduce the option value of default in bond pricing and therefore reduce the offered returns on bonds.

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Fig. 1. Convergence Path of Prices to the Disclosure Date Bond Value?
We illustrate the path of average absolute price differentials between the price across all issues during the reorganization process and the price at the disclosure date ($Abs\left(\log\frac{P_{i,t}}{P_{i,d}}\right)$ where $P_{i,t}$ is the price of bond issue i at time t and $P_{i,d}$ is the average price of issue i during the 10 days following the disclosure statement date d). Along the Y axis, the chart displays the absolute log price differential and along the X axis we plot the percentage of the process remaining (divided into 5 percent windows) until the disclosure statement date. The blue dots represent disseminated bonds, and the red dots represent non-disseminated bonds.

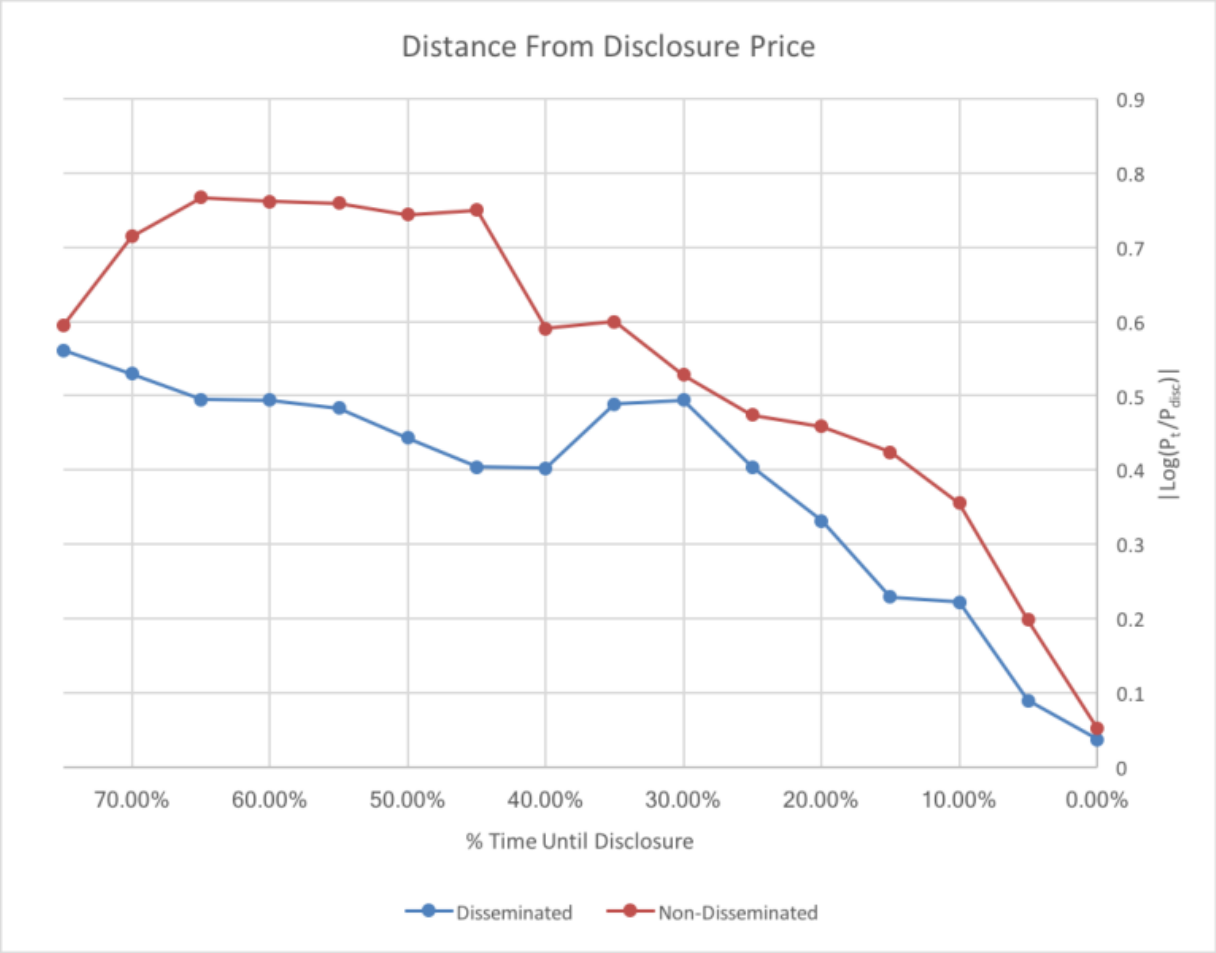

Table 1: Summary Statistics

This table displays the mean characteristics of 62 Chapter 11 reorganizations in our sample. All sample firms filed prior to December 31st 2005, had outstanding SEC-registered bonds that were publicly traded during the firm's Chapter 11 process and had common stocks of all sample firms that were publicly traded upon emergence from Chapter 11. Disclosure indicates that the firm's bond prices were publicly disseminated via TRACE during Chapter 11. Panel A presents the average court misvaluation of the reorganized firm's newly-issued common stocks. Misvaluation is the absolute value of the difference between the court-determined value and the post-emergence market value of the newly issued stocks, scaled by the average of the two values. Panel B presents the frequency and average size of intended and unintended inter-claimant wealth transfers in sample reorganizations. Panel C and D provide bankruptcy and firm characteristics, respectively. We use ***, **, and * to denote that the difference in the average values for the disclosure group and the non-disclosure group are significantly different from each other at the 1%, 5%, and 10% level, respectively.

Panel A. Average Misvaluations

	(1) Overall	(2) Disseminated	(3) Not Disseminated	(4) Difference [(2)-(3)]
Misvaluation (%)	57.3	33.0	68.9	−36.0***
Misvaluation (%) <25%	33.9	45.0	28.6	16.4
Misvaluation (%) [25% to 50%)	19.4	30.0	14.3	15.7
Misvaluation (%) [50% to 100%]	25.8	20.0	28.6	−8.6
Misvaluation (%) >100%	21.0	5.0	28.6	−23.6**
100 x Unintended violation (d)	29.0	15.0	35.7	−20.7*
Avg. size of unintended violation	8.4	1.2	11.8	−10.6*
Observations	62	20	42	62

Panel B. Bankruptcy Characteristics

	(1) Overall	(2) Disseminated	(3) Not Disseminated	(4) Difference [(2)-(3)]
100 x Pre-packaged (d)	59.7	80.0	50.0	30.0**
Days in Chapter 11	419.9	561.1	352.7	208.5***
100 x Creditors' committee (d)	82.3	95.0	76.2	18.8*
100 x Equityholders' committee (d)	14.5	25.0	9.5	15.5
100 x Court: Delaware or New York S.D. (d)	59.7	70.0	54.8	15.2
Observations	62	20	42	62

Panel C. Firm Characteristics

	(1) Overall	(2) Disseminated	(3) Not Disseminated	(4) Difference [(2)-(3)]
Assets (at filing) (log)	7.6	8.4	7.1	1.3***
Leverage ratio (at emergence) (%)	34.4	26.0	38.4	−12.4**
Stock volatility (post-emergence) (%)	19.8	14.5	22.4	−7.9**
100 x Analyst coverage (d)	72.6	75.0	71.4	3.6
Analyst Forecast Error (pre filing)	0.1	0.2	0.1	0.1*
Analyst Forecast Dispersion (pre filing)	0.2	0.2	0.2	−0.0
Observations	62	20	42	62

Panel D. Other Indicators

	(1) Overall	(2) Disseminated	(3) Not Disseminated	(4) Difference [(2)-(3)]
Bond Percent Days Traded (%)	27.5	46.6	18.3	28.3***
100 x Bids on assets during Ch. 11 (d)	30.6	65.0	14.3	50.7***
100 x Vultures among largest unsecured creditors (d)	19.4	20.0	19.0	1.0
Observations	62	20	42	62

Table 2: Disclosure of Bond Prices and Court Misvaluation

We estimate ordinary least squares (OLS) regressions to examine the impact of public dissemination of bond transactions via Trade Reporting and Compliance Engine (TRACE) on court misvaluations. The sample is restricted to Chapter 11 reorganizations by firms with publicly traded bonds during the bankruptcy process and publicly traded common stock after emergence from Chapter 11. The table reports coefficients as well as t-statistics based on robust standard errors (in parentheses). We use ***, **, and * to denote that the estimated coefficient is significantly different from zero (two-tailed) at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Disseminated (d)	−35.95***	−41.59***	−28.73***		−33.78**	−29.01**	−36.38***
	(−3.47)	(−3.34)	(−2.78)		(−2.09)	(−2.11)	(−2.75)
Disclosure initiated in Phase 1 (d)				−32.69**			
				(−2.22)			
Disclosure initiated in Phase 2 (d)				−30.83			
				(−1.38)			
Disclosure initiated in Phase 3 (d)				−35.96***			
				(−3.08)			
Disclosure initiated after Phase 3 (d)				−43.48***			
				(−3.05)			
Assets (at filing) (log)					0.74		
					(0.15)		
Leverage ratio (at emergence) (%)					0.31		
					(0.99)		
Bond Percent Days Traded (%)					−0.31		
					(−1.04)		
Stock volatility (post-emergence) (%)						0.84	
						(1.56)	
Analyst Forecast Error (pre filing)						44.07	
						(1.29)	
Free Fall (d)							17.20
							(1.26)
Creditors' committee (d)							−20.22
							(−1.20)
Equityholders' committee (d)							−0.68
							(−0.04)
DE or NY SD (d)							−5.37
							(−0.40)
Constant	68.91***			68.91***		40.90***	78.72***
	(8.22)			(8.02)		(2.95)	(3.80)
Emergence year dummies	N	Y	N	N	N	N	N
File year dummies	N	N	Y	N	N	N	N
Industry dummies	N	N	N	N	Y	N	N
N	62	62	62	62	62	45	62
R^2	0.12	0.66	0.66	0.12	0.70	0.18	0.16

Table 3: Unintended Violations of APR

We estimate OLS regressions to estimate whether dissemination reduces the size of unintended APR violations, relative to the market value of newly-issued common stock on emergence. We use ***, **, and * to denote that the difference is significantly different from zero (two-tailed) at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Disseminated (d)	−10.55**	−21.05	−11.30**		−13.24**	−12.99	−8.57***
	(−2.61)	(−1.47)	(−2.08)		(−2.17)	(−1.44)	(−2.67)
Disclosure initiated in Phase 1 (d)				−8.02			
				(−1.55)			
Disclosure initiated in Phase 2 (d)				−11.76***			
				(−2.89)			
Disclosure initiated in Phase 3 (d)				−10.50**			
				(−2.47)			
Disclosure initiated after Phase 3 (d)				−11.36***			
				(−2.78)			
Bond Percent Days Traded (%)					−0.13		
					(−0.67)		
Assets (at filing) (log)					1.60		
					(0.72)		
Leverage ratio (at emergence) (%)					−0.23		
					(−1.24)		
Stock volatility (post-emergence) (%)						0.20*	
						(1.70)	
Analyst Forecast Error (pre filing)						62.07	
						(1.30)	
Free Fall (d)							3.92
							(0.57)
Creditors' committee (d)							−14.02
							(−1.03)
Equityholders' committee (d)							7.04
							(1.28)
DE or NY SD (d)							−10.60*
							(−1.80)
Constant	11.76***			11.76***			25.61*
	(2.96)			(2.89)			(1.83)
Emergence year dummies	N	Y	N	N	N	N	N
File year dummies	N	N	Y	N	N	N	N
Industry dummies	N	N	N	N	Y	N	N
N	62	62	62	62	62	45	62
R^2	0.05	0.26	0.23	0.05	0.25	0.27	0.17

Table 4: The Effect of Disclosure and the Information Environment

We estimate ordinary least squares (OLS) regressions to examine the cross-sectional variation in the effect of bond price dissemination on court misvaluations in Chapter 11 reorganizations. The table reports coefficients as well as t-statistics based on robust standard errors (in parentheses). We use ***, **, and * to denote that the estimated coefficient is significantly different from zero (two-tailed) at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Disseminated (d)	−95.93***	−21.96	−7.57	−47.17***
	(−3.92)	(−1.47)	(−0.39)	(−3.56)
Number of analysts (log) (pre filing)	−21.03**			
	(−2.29)			
Disseminated (d) x Number of analysts (log)	34.62***			
	(2.97)			
Analyst Forecast Error (pre filing)		124.08**		
		(2.03)		
Disseminated (d) x Analyst Forecast Error		−122.92*		
		(−1.84)		
Stock volatility (post-emergence) (%)			0.79	
			(1.42)	
Disseminated (d) x Stock volatility (%)			−1.53*	
			(−1.69)	
Actively traded bonds (d)				−33.09**
				(−2.05)
Disseminated (d) x Actively traded bonds (d)				41.86**
				(2.07)
Constant	98.81***	54.13***	51.22***	74.43***
	(4.92)	(5.43)	(3.53)	(7.75)
N	45	45	62	62
R^2	0.19	0.18	0.15	0.16

Table 5: Absolute Returns Around Disclosure Statement Date: With and Without Disseminated Bonds

We estimate ordinary least squares (OLS) regressions to examine the impact of dissemination on absolute bond returns during the ten trading days centered on the disclosure statement date. The sample includes firms with publicly traded bonds issued by companies that filed for Chapter 11 reorganization before January 1, 2006 and which appear in the UCLA-Lopucki Bankruptcy Research Database. The independent variables include a proxy for bond liquidity, the log dollar value of publicly traded debt, the proportion of outstanding bonds traded in the 30 days after filing, whether the bankruptcy was a "Free Fall" (those without pre-filing negotiations), as well as controls for time of filing and the "moneyness" of the bonds around filing date (whether the bonds were trading near par, near zero, or somewhere in between). In addition, in columns (5) and (6) we include interaction terms between dissemination and our proxy for liquidity as well as the "Free Fall" indicator. The table reports coefficients as well as t-statistics based on robust standard errors (in parentheses) clustered at the company level. We use ***, **, and * to denote that the estimated coefficient is significantly different from zero (two-tailed) at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7) Confirm Date
Disseminated (d)	−0.10**	−0.10*	−0.09*	−0.08*	−0.11	0.01	0.02
	(−2.21)	(−1.74)	(−1.76)	(−1.72)	(−1.31)	(0.23)	(0.31)
Bond liquidity (% of days traded in Ch. 11)		−0.12	−0.19	−0.11	−0.20	−0.12	−0.03
		(−0.86)	(−1.22)	(−0.98)	(−0.82)	(−1.01)	(−0.15)
Total Debt (Public Bonds - log)		−0.03*	−0.03	−0.03	−0.03	−0.03	0.01
		(−2.00)	(−1.41)	(−1.61)	(−1.62)	(−1.56)	(0.36)
Turnover Around Filing (%)		0.01	0.01	0.02	0.01	0.02	0.02
		(0.26)	(0.59)	(0.88)	(0.72)	(0.93)	(1.02)
Free Fall Bankruptcy (d)		0.05	0.06	0.05	0.05	0.06	0.10
		(0.55)	(0.71)	(0.65)	(0.65)	(0.69)	(1.01)
Disseminated (d) X Bond liquidity (%)					0.15		
					(0.59)		
Disseminated (d) X Free Fall (d)						−0.10	
						(−1.17)	
File Year FE	Y	Y	Y	Y	Y	Y	Y
Security Level FE	N	N	Y	Y	Y	Y	Y
Moneyness FE	N	N	N	Y	Y	Y	Y
N	175	175	173	173	173	173	158
R^2	0.080	0.117	0.151	0.187	0.188	0.189	0.248

Table 6: The Impact of Dissemination on Average Daily Bond Return Variance

We estimate ordinary least squares (OLS) regressions to examine the effect of dissemination on average daily bond return variance ($\frac{\sigma R_i}{\sqrt{T}}$) during the reorganization process. The sample includes the publicly traded bonds issued by companies that file for Chapter 11 reorganization prior to January 1, 2006 and appear in the UCLA-Lopucki Bankruptcy Research Database. The independent variables include a proxy for bond liquidity, the log dollar value of publicly traded debt, the proportion of outstanding bonds traded in the 30 days after filing, whether the bankruptcy was a "Free Fall" (those without pre-filing negotiations), as well as controls for time of filing and the placement of each issue within the firms capital structure. The table reports coefficients as well as t-statistics based on robust standard errors (in parentheses) clustered at the company level. We use ***, **, and * to denote that the estimated coefficient is significantly different from zero (two-tailed) at the 1%, 5%, and 10% level, respectively.

	(1) Pre	(2) Post	(3) Pre	(4) Post
Disseminated (d)	−0.69*	−0.00	−0.51**	−0.06
	(−1.95)	(−0.04)	(−2.05)	(−0.83)
Free Fall Bankruptcy (d)			0.61	0.09
			(1.18)	(1.38)
Total Bond Debt (log)			0.21*	−0.05*
			(1.92)	(−1.74)
Turnover Around Filing (%)			0.22	−0.00
			(1.56)	(−0.08)
Bond liquidity (% of days traded in Ch. 11)			−3.18***	−0.25**
			(−3.81)	(−2.51)
File Year FE	Y	Y	Y	Y
Security Level FE	Y	Y	Y	Y
N	271	237	271	237
R^2	0.280	0.190	0.322	0.257