Financial Firm Bankruptcy and Contagion

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ABSTRACT

The Lehman bankruptcy highlights the potential for interconnectedness to cause negative externalities through counterparty contagion, but the externalities may also arise from information contagion. We examine troubled financial firms and find that both channels are significant factors in creating spillover effects. Counterparty contagion is greater in cases of riskier firms and larger and more complex exposures. However, the counterparty exposures are small, especially among banks that face diversification regulations, and do not typically cause a cascade of failures. Information contagion is stronger for rivals in the same markets and has a larger impact in cases of distress than in bankruptcies.

The recent financial crisis has renewed interest in the question of what happens to other firms when a financial institution becomes distressed. For example, Yang and Zhou (2013) investigate credit risk spillovers among financial firms using credit default swap (CDS) data. Several other studies analyze the impact of Lehman's failure (Aragon and Strahan (2012), Chakrabarty and Zhang (2012), Fernando, May and Megginson (2012), and Jorion and Zhang (2012)). Their results highlight losses incurred by counterparties (Jorion and Zhang (2009)) and disruptions when a distressed bank withdraws funding from its borrowers (Ivashina and Scharfstein (2010)).

Studies written before the crisis also find evidence of negative effects on other firms but their focus is typically on nonfinancial firms that are competitors or part of the bankrupt firm's supply chain (Lang and Stulz (1992), Jorion and Zhang (2007), Theocharides (2008), Hertzel, Li, Officer and Rodgers (2008) and, later, Hertzel and Officer (2012)).[1] An earlier literature by Aharony and Swary (1983, 1996), Karafiath and Glascock (1989), Wall and Peterson (1990), Dickinson, Peterson, and Christiansen (1991), Fenn and Cole (1994), Fields, Ross, Ghosh, and Johnson (1994), and Fields, Klein, and Myskowski (1998) examines financial firm distress, often using the case of one or a few major banks during the 1980s, and finds significant negative effects on rivals. However, these studies do not consider the impact on counterparties of the banks.

While the consensus in the literature is that the impact of a bankruptcy filing on other firms is negative, the interpretation of the source of the spillover is less clear. Authors of earlier studies often characterize the effects as information flows that arise when the bankruptcy (or bailout) causes investors to update their beliefs about firms with similar characteristics (information contagion).[2] In contrast, more recent studies of financial firm failures typically interpret the results as evidence of systemic risk related to interconnected financial firms. For example, Furfine (2003), Arora, Gandhi and Longstaff (2012), Billio, Getmansky, and Pelizzon (2012), Staum (2012), Billio, Getmansky, Gray, and Lo, Merton and Pelizzon (2013) highlight the potential for direct business ties related to interbank loans and derivatives trades to create networks that are inherently unstable (counterparty contagion).[3]

[1]Lang and Stulz (1992) posit that rivals' stock reactions could be positive if the filing reveals that they will gain market share. Zhang (2010) finds such effect in a few instances for firms upon exit from bankruptcy.

[2]Lang and Stulz (1992), Benzoni, Collin-Dufresne, Goldstein and Helwege (2012), Pirinsky and Wang (2006) and Veronesi (2000) analyze how information flows from one firm's securities to another's. An alternative form of contagion related to depressed asset prices is discussed by Benmelech and Bergman (2012).

[3]Studies of systemic risk that focus on interconnected financial markets include Adrian and Brunnermeier (2010), Acharya, Pedersen, Phillipon and Richardson (2010), Adrian and Brunnemeier (2010), Drehmann and Tarashev (2011), Huang, Zhang and Zhou (2009), Suh (2011), Rochet (2010), Acemoglu, Ozdaglar and Tahbaz-Salehi (2013), Acharya and Bisin (2014) and Zawadowski (2012).

Both counterparty contagion and information contagion could be important for interconnected financial firms, but few empirical studies consider both types of spillover effects.[4] In this paper we measure the effects of both counterparty contagion and information contagion by conducting two types of event studies. Like Lang and Stulz (1992), we estimate the impact of bankruptcy on competitors to assess the extent of information contagion related to industry cash flows. Because many of the financial firms are regulated and benefit from "too big to fail" (TBTF) policy, we also examine distressed firms that do not file for bankruptcy. Furthermore, we extend the approach of Lang and Stulz (1992) by measuring information contagion among the subset of competitors with similar geographic exposures or that are also in real estate.

To separate the impact of information contagion from counterparty contagion, we also conduct event studies to evaluate the impact of a bankruptcy filing on the creditors of the firm. While systemic risk effects will impact all firms in the economy, in the case of counterparty contagion the firms at the "epicenter" of the shock are those that lent money to the failed firm or were exposed to losses from financial market transactions such as CDS. Thus, if counterparty contagion is important, an event study of the stocks of the bankrupt firm's creditors should reveal significant negative effects. We also evaluate counterparty contagion by considering the magnitude of counterparty exposures and the frequency of cascades of bankruptcies. We identify counterparties from bankruptcy court filings (see Jorion and Zhang (2009)) and from two other unique sources, the Epiq Systems debtorMatrix (which has data on Lehman Brothers and American Home Mortgage (AHM)), and Congressional testimony (which allows us to evaluate counterparty contagion related to American International Group (AIG)).[5]

We evaluate contagion with a large sample of distressed and bankrupt financial firms over the period 1980-2010. Our findings suggest that both counterparty contagion and information contagion are significant factors in creating spillover effects in financial firm bankruptcies. However, neither effect is exceptionally large. Counterparty contagion effects are larger for firms with greater exposures and exposures involving derivatives, and for firms with higher equity return volatilities. We attribute the modest role of counterparty contagion to the fact that financial firms, especially commercial banks, usually hold diversified portfolios. We report statistics that show exposure to a bankrupt financial firm is typically too small to wipe out a counterparty's equity, even in cases where a financial firm has exposure to several failed firms at once. The small estimated effects from counterparty contagion event studies are also consistent with our observation that financial firm bankruptcies rarely cause a cascade of failures.

We find that information contagion effects are also significant. The estimated impact of the news from a financial firm failure is larger for rivals in the same locale or the same line of business.

[4] Exceptions are Jorion and Zhang (2012), who consider the failure of Lehman, and Kolay, Lemmon and Tashjian (2013), who analyze trade credit losses to suppliers of nonfinancial firms.
[5] American Home Mortgage (AHM) was an alt-A lender that failed during the subprime crisis.

Information contagion has a larger impact in cases of distress than in bankruptcies. These findings on information contagion may reflect the fact that information is known to investors well before the date of the bankruptcy filing (Hertzel, Li, Officer and Rodgers (2008)).

Our study contributes to a large literature on financial contagion channels, including recent papers on fire sales (e.g., Allen, Babus, and Carletti (2011), Brunnermeier (2009), Shleifer and Vishny (2011)) and market liquidity (e.g., Boyson, Stahel and Stulz (2010), Brunnermeier and Pedersen (2009), Covitz, Liang, and Suarez (2012), Dudleya and Nimalendrana (2011), Gorton and Metrick (2012), Kacperczyk and Schnabl (2010), Longstaff (2010), Mitchell and Pulvino (2012), and Strahan and Tanyeri (2013)). Fire sales might explain why we find stronger information contagion effects for firms operating in the same business, as they are likely to hold similar assets and would suffer greater losses from fire sales. Similarly, industry information contagion effects may reflect liquidity problems among firms that rely on the same markets for funding. We note that most of these studies rely on aggregate data whereas our study is based on micro-level risk related to individual financial firms.

1. Analytical Framework

Models of interbank lending by Rochet and Tirole (1996), Allen and Gale (2000), and Eisenberg and Noe (2010), as well as the corporate bond pricing models of Jarrow and Yu (2001), Davis and Lo (2001), Giesecke and Weber (2004), and Kraft and Steffensen (2007), show how counterparty relationships impact risk in financial markets. Counterparty risk is also an important element of derivatives pricing (e.g., Cooper and Mello (1991)) and is related to the debate about the desirability of exchange trading compared to over-the-counter markets (Duffie and Zhu (2012), Pirrong (2009), Cecchetti, Gyntelberg and Hollanders (2009), Hull (2010), and Duffie, Scheicher,Vuillemey (2014)). These studies highlight the potential for the failure of a financial firm to impact the securities of other firms that have direct business ties with it.

According to this literature, creditors in a bankruptcy filing would be affected the most and those with the most negative valuation effects would be the ones with the largest unsecured claims. In contrast, firms with small debts or debts with low losses (collateralized debt) would be less affected.[6] The most extreme negative effect on a counterparty occurs when a bankruptcy filing causes losses that are so large that they drive a creditor into insolvency, which in turn could cause a third bankruptcy. Thus, we consider the frequency of subsequent bankruptcies in hypothesis H1:

[6]If collateral backing a secured debt or derivative is not sufficient for a secured creditor to recoup his entire claim, the impaired part of the claim is included in the bankruptcy document as an unsecured creditor claim. Thus, by definition, the unsecured creditor claims are more likely to involve losses to related firms than collateralized debt.

H1: Financial firm bankruptcies cause other financial firms that are creditors to file for bankruptcy, leading to a cascade of failures.

Creditors may be affected through an increase in the probability of default without actually being forced into bankruptcy. Thus, we expect that creditors' stock returns will be reduced upon the announcement of a bankruptcy. Moreover, interconnectedness among financial firms is likely to have a larger impact if banks have substantial dealings in capital markets (Adrian and Brunnermeier (2010)) or if banks enter into bilateral contracts (such as CDS) that directly impact the probability of failure of another firm (Giglio (2011)). Derivatives claims are usually larger and more complex, and therefore could have a more negative impact on the creditors. Thus, we form our second hypothesis as follows:

H2: Financial firm bankruptcies have negative effects on the stocks of other financial firms that are unsecured creditors. The magnitude of the effects is greatest among the unsecured creditors with the largest claims and those related to derivatives.

Creditors of distressed firms that have not yet entered Chapter 11 will likely correctly forecast greater expected losses on their loans, so that by the time bankruptcy occurs their stock prices may already have impounded the counterparty risk. Thus, we extend H2 to include cases of financial distress as well as actual bankruptcy. While the impact on other firms may be larger in cases of distress, the opposite may be true if the distressed firm avoids default and continues to repay its debts as promised:[7]

H2a: Distressed firms have negative effects on other financial firms that are creditors and the magnitude of the effects is greatest among the unsecured creditors with the largest claims and those related to derivatives.

A second channel through which financial firm bankruptcies create spillovers is information contagion. In this situation, the effects arise because of information about common cash flows and the impact is greatest on competitors in the same market or on firms that share similar characteristics.[8] If information effects are an important factor in financial firm failures, then bankruptcy filings will contain the most negative news for stocks of firms with similar businesses or subject to common factors (Flannery (1998)). Aharony and Swary (1996) indicate that geographic proximity to a failed bank is a significant determinant of other banks' revaluations.[9] In addition, studies of failures and bailouts of large

[7] For example, a hedge fund that hears about the distress of its prime broker could move its business elsewhere before the firm actually files for bankruptcy. Or, if the claim is a short-term debt contract such as an overnight repo or commercial paper, the creditor may no longer be involved with the debtor firm when it files for bankruptcy protection.

[8] See Veronesi (2000), Benzoni, Collin-Dufresne, Goldstein and Helwege (2012), Giesecke (2004), King and Wadhani (1990), Kodres and Pritsker (2002), and Bai, Collin-Dufresne, Goldstein and Helwege (2012).

[9] Geographic proximity is especially important for depository institutions as they were restricted from operating across state lines until 1994 (Stiroh and Strahan (2003)).

commercial banks by Karafiath and Glascock (1989), Dickinson, Peterson, and Christiansen (1991), and Wall and Pederson (1990) highlight the similarity of competitors' loan portfolios in understanding the externalities. Acharya, Mehran, Schuermann and Thakor (2011) argue that regulatory safety nets create incentives for banks to engage in correlated asset choices. However, most existing studies on information contagion fail to control for counterparty effects.[10] To separate out information effects from counterparty effects, we conduct an event study where we exclude the reactions of rival firms that are also creditors of the bankrupt firms. Our third hypothesis is formulated as follows:

H3: Bankrupt and distressed financial firms have negative effects on other financial firms and the magnitude of the effects is greatest among industry peers (firms in the same 4-digit SIC code) that are in the same line of business or are located in the same state.

By the same logic as H2a, H3 applies to distressed firms as well as bankrupt firms.

Our focus is on negative externalities, but competitive effects could result in positive stock returns for rivals (Slovin, Shushka and Polonchek (1999) and Egginton, Hilliard, Leibenberg and Leibenberg (2010)). If competitive effects cause positive reactions, this should occur more often among firms that operate in the same product markets.

H4: Bankrupt and distressed financial firms have positive effects on other financial firms and the magnitude of the effects is greatest among industry peers (same 4-digit SIC code) that are in the same line of business or are located in the same state.

2. Data and Methodology

Our analysis requires data on two types of firms: (1) troubled firms whose bankruptcy filings or news of distress might generate contagion effects; and (2) other firms that might be affected by the news of a filing or distress (counterparties and rivals). We create a sample of firms in group (1) by examining financial firm bankruptcies identified from bankruptcydata.com. We expand the number of potential firms for group (1) by using the procedure in Gilson (1989) to identify cases of distress. Group (2) consists of counterparties and rivals that are in the same line of business or are located in the same state. We elaborate on the source of these data in more detail below.

Our main methodology is an event study of the stock market reactions of affected firms. We create equally weighted portfolios of creditors and of peer firms, where the latter include firms in the same 4-digit SIC code that are *not* also creditors of the troubled firm.[11] The abnormal return (AR_{jt}) for portfolio j on day t is defined as follows:

$$AR_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt}), \qquad (1)$$

[10] Exceptions are Jorion and Zhang (2012) and Chakrabarty and Zhang (2012), who analyze Lehman's bankruptcy.
[11] We construct equally-weighted portfolios, but we find similar (unreported) results with value-weighted portfolios.

where R_{jt} is the rate of return for portfolio j on day t. The market model parameters (α_j, β_j) are estimated using the CRSP value-weighted index as the market return (R_{mt}). The CRSP return is over a 200-trading-day window that ends 50 days before the event. We average these abnormal returns over the event window $[T_1, T_2]$, where T_1 and T_2 are the number of days relative to the day of the bankruptcy announcement or the distress day and test for significance following MacKinley (1997). We also report the proportion of negative abnormal returns and show its significance with a generalized sign test (Cowan, Nandkumar and Singh (1990)).

a. Bankruptcy filings

We match the 235 public and private financial firm bankruptcies obtained from bankruptcydata.com to firms in Compustat that have SIC codes in the 6000 range during the period 1980-2010. The process creates a sample of 170 financial firm bankruptcies, which is further reduced to 142 bankruptcies when we check that the firm has stock return data in CRSP.

b. Creditor data

We obtain data on the creditors of these bankrupt firms from bankruptcydata.com, which usually provides the names and exposures of the top 20 unsecured claimants. The creditor data are available for 88 bankrupt firms because the information from court filings is largely unavailable before 1999. We supplement the creditor data for Lehman and AHM with the Epiq Systems debtorMatrix, which include details on all claims filed by creditors in bankruptcy (as opposed to claims reported by the bankrupt company).[12] In addition, we obtain creditors for AIG from Congressional testimony about the Federal Reserve's bailout of the company.

c. Distressed firms

Following Gilson (1989), we examine 3-year cumulative stock returns and select the stocks of financial firms that are in the bottom 5% of the CRSP universe each year. The sample is created with data from 1980-2010 and includes only firms that have assets above the sample median.[13] Using the approach in Hertzel, Li, Officer and Rodgers (2008), we define the distress date as the day when the firm's stock price experiences the largest decline in the 3-year period.[14] We further confirm the importance of this day by investigating the news in Lexis-Nexis to determine that important new information came out about the

[12]The Epiq source for Lehman is http://chapter11.epiqsystems.com/LBH/claim/SearchClaims.aspx?rc=1. We use data on Lehman creditors from both sources (Epiq and www.bankruptcydata.com).

[13] This allows us to focus on cases of distress that are likely to have meaningful information effects.

[14] We also consider distressed firms' quarterly earnings announcements by examining days with negative earnings surprises that lead to negative returns. In unreported estimations, we find that these dates often indicate distress earlier than the distress days in our analysis, but the effects of contagion are quite weak on such negative earnings days.

firm on that date. If we find no news to explain the decline, we eliminate the observation. We also require that two consecutive events involving firms in the same 4-digit SIC industry code be at least two weeks apart in order to isolate the effects of information contagion. The distressed firms sample includes 149 financial institutions. Their worst daily stock returns range from -6.5% to -90%.[15]

d. Rivals

We identify rivals that may suffer from information contagion using Compustat's 4-digit industry codes.[16] Information from a bankruptcy or distress event will be most relevant for rivals that are operating in the same geographic area as the troubled firm (Aharony and Swary (1996)), which we obtain from Compustat. A large number of bankrupt and distressed financial firms suffer from losses on investments in real estate (Cole and White (2012)), which cuts across 4-digit SIC industries. Thus, we also create portfolios of firms in the real estate (RE) business by investigating the companies' business lines in Lexis-Nexis. If the news explicitly mentions that the troubled firm experienced distress due to real estate investments, we set the RE variable to one. For rival firms, we create the RE indicator using the following method: First, we read the descriptions of SIC codes (all the firms in SIC codes 6162, 65xx, and 6798 are in real estate). For other industries, we read Compustat business descriptions. If terms such as 'real estate', 'mortgage', or 'properties' are mentioned in the blurb, the RE variable is set to one. When the business descriptions in Compustat are abbreviated and incomplete, we also read descriptions in Businessweek (which start with the same words as those in Compustat, but are more detailed).[17] If a firm does not operate in an SIC code in the RE industry and it does not have a business description in Compustat or Businessweek, its RE indicator value is missing.

d. Summary statistics

Table I presents summary statistics on the bankrupt firms and distressed firms samples. Panel A shows the time series of bankruptcy filings and worst days for the distressed firms. Not surprisingly, the worst year in our sample is 2009, when 25 publicly traded financial firms declared bankruptcy. Panel B shows the firms' industries. The largest industry among the 4-digit SIC codes for both bankruptcies and distress is commercial banking. Banks, along with other depository institutions, make SIC code 60 the largest of the 2-digit categories. Several dozen insurers (SIC 63) are in both the bankrupt firms and distressed firms samples, but life insurers tend to avoid bankruptcy to a greater extent than property and casualty insurers. Mortgage brokers and real estate investment trusts (REITs) are also common among the

[15] The firms in the distressed sample and the bankruptcy sample are not mutually exclusive: 36 of the 149 firms in the distressed sample are also in the bankruptcy sample (the remaining firms are mostly excluded by the size restriction). In untabulated results, we find that excluding the bankrupt firms from the distress sample does not qualitatively change our findings.

[16] See Kahle and Walkling (1996) on differences between SIC codes in CRSP and Compustat.

[17] See http://investing.businessweek.com/research/common/symbollookup/symbollookup.asp

bankrupt firms, but only the REITs also have large numbers in the sample of distressed firms. Panel C shows that the bankruptcies and cases of distress are more often located in the most populous states (e.g., California, New York, Texas, and Florida). As in Cole and White (2012), Panel D indicates that many bankrupt and distressed financial firms are exposed to declines in real estate values (nearly two-thirds have RE equal to one).

Data on assets in Panel E of Table 1 are consistent with TBTF policy, which prevents very large financial firms from filing for bankruptcy. TBTF policies reduce the average size of a bankrupt financial firm in our sample, but the bankrupt firm sample does include Lehman (the biggest bankruptcy in U.S. history, with nearly $700 billion in assets), Washington Mutual (WAMU) and CIT Group. Furthermore, we are able to address information contagion among TBTF banks by analyzing large financially distressed firms, such as Royal Bank of Scotland, AIG, Citigroup, Fannie Mae, Freddie Mac, Bear Stearns, and Continental Illinois. While data availability prevents analysis of counterparty risk for most of these large distressed firms, data from Congressional testimony allows an investigation into counterparty contagion in the case of AIG. That bailout involved payments on 51 contracts owed to 29 firms, including 19 firms with data on Compustat and CRSP.

Table II shows data on the number of firms in the portfolios of rival firms and creditors. The bankrupt and distressed firms in RE are much more likely to have many rivals that are also in RE, reflecting the wide use of real estate as collateral in loans and mortgage-backed securities. Table II also shows the number of firms in our sample that are likely to be affected by counterparty contagion in a bankruptcy. The creditors with publicly traded equity in CRSP are used in the event studies. Most creditors are not in the same industry as the bankrupt firm (only 4 creditors have the same 4-digit SIC code as the bankrupt firm).

We exclude trustees from the list of publicly traded creditors. Trustees are typically among the largest unsecured creditors of a bankrupt firm (Jorion and Zhang (2009) and Helwege (2010)). For example, in the case of WAMU, the largest unsecured creditor is the Bank of New York (BONY) as trustee for the junior subordinated debentures, who were owed $1.15 billion. BONY was responsible for filing the claim against WAMU, but BONY itself was not owed any funds and BONY would not have negotiated a recovery on the bond.[18] We do not have data on the ultimate investors that trustees represent, but other studies on the dispersion of creditors suggest that most bondholders have fairly low exposures. For example, Han and Zhou (2009) use Emaxx data to show that a typical bond issue is owned by 103 institutional investors. Massa, Yasuda and Zhang (2010) conclude that the investors reported in Emaxx,

[18] The next 12 largest unsecured creditors of WAMU are bondholders that have BONY as the trustee, where claims range from $176 million to $805 million. The 14th creditor is Verizon.

as a group, hold approximately half of the par amount outstanding of the bonds. This suggests that the largest bond claim owed to any one WAMU junior subordinated bondholder was likely less than $10 million. Thus, we infer that even if the ultimate creditors were reported in a bankruptcy filing (instead of the trustees), their claims would likely be too small to make the list of the top 20 creditors.[19] In the sample of 88 firms with creditor information, nearly all have at least one unsecured creditor that is not a trustee.

Table II shows that the many of the creditors that are not trustees are financial firms, as one would expect if interconnectedness is a major element of a financial crisis. Indeed, the vast majority (79 of 88) has at least one financial firm creditor at the time of the bankruptcy filing.

A potential concern with the creditor data in Table II is that other important counterparties are overlooked in our analysis. We address this issue in two ways. First, we note that the smallest of the top 20 creditors often has a claim that is less than $20 million, which means the omitted creditor claims would be too small to have significant spillover effects. Second, in the robustness tests section we also investigate the exposures to Lehman using data from an alternative source, Epiq Systems debtorMatrix, which includes all its creditors. This concern is also mitigated somewhat by the data on counterparties of AIG, which include all the creditor firms that regulators perceived as capable of causing disruptions in capital markets.

3. Results

We present the results of three types of test in this section. To test H1 and H2, we first analyze the size of unsecured creditor claims and therefore the potential exposures that could cause counterparty contagion, and the number of creditors that subsequently file for bankruptcy as a result of large exposures. Second, we conduct event studies on the bankruptcy announcements to determine if there is a significant negative impact on unsecured creditors. Lastly, we carry out event studies on the effects of distress and bankruptcy on rival firms in the same market to determine the extent to which contagion is information-based, as predicted by H3 and H4.

a. Counterparty contagion and the size of creditor exposures

Table III reports the absolute and relative sizes of the claims owed by the sample of the 88 firms that have creditor claims data. Panel A shows the aggregate value of the claims and the overall distribution of the debt. These firms owed more than $250 billion to their unsecured creditors. However, the money is mostly owed to trustees. Apart from the trustees, the sums owed to creditors total $29.8 billion. The financial firm creditors are only owed $27 billion in total, or $344 million per bankruptcy on average.

[19] This result is not peculiar to financial firm bankruptcies, as Jorion and Zhang (2009) report similar patterns for their sample.

Panel B shows data on financial firm creditors' claims. The mean amount owed is $53.4 million and the median is sharply lower at less than $4 million. The means are affected by Lehman and WAMU, the two largest U.S. bankruptcies to date. Yet, no claim of another financial institution is as high as $2 billion and only 4 percent of the claims are above $1 billion. The largest single claim is for $1.9875 billion, owed by CIT in its Ch. 11 filing of November 2009. Note that the largest amount owed in the case of a bankrupt commercial bank is only $79.1 million. In order to gauge the size of these exposures relative to a creditor's ability to absorb losses, we require data on the size of the balance sheet of the creditor, which we obtain for publicly traded firms in Compustat. Panel C reports summary statistics on these claims. Note that the publicly traded firms are generally larger than private firms, but their average and median unsecured claims are smaller. And in cases of bankrupt commercial banks, the claims are typically smaller still.

Compared to the assets of the publicly traded creditors, the claims owed to them by bankrupt financial firms are very small. Panel D shows that these claims are only .05% of their total assets on average. This likely reflects the fact that financial firm exposures are limited because regulations require diversification. In particular, bank regulations require that loans to one borrower be no more than 15 percent of the capital of the bank. Since few banks have capital that exceeds 10% of their assets, this effectively means that most loans will be below 1.5% of assets. Likewise, insurance company regulations require portfolios be diversified and the SEC constrains mutual funds as well.

Moreover, financial firms do not often extend credit that is uncollateralized. For example, many bank loans are secured, repurchase agreements (repos) involve securities for borrowing, and most derivative contracts are collateralized. Thus, some of the unsecured claims in a bankruptcy will relate only to the portion of a secured loan that has insufficient collateral. Hence, the average unsecured claim of a financial firm should be well under 1.5% of assets if it obeys diversification rules. We test whether commercial bank creditors have exposures that are more than 1.5% of assets and find that they are always less than 1.5% of the assets of the bank. Indeed, this is true for all other creditor firms in Panel D.

One concern is that the losses from these bankruptcies could be quite high relative to their equity because most financial institutions are highly levered. Panel E shows that creditors stand to lose an average of about .25% of the market value of their equity as a result of losses to bankrupt firms. Nonetheless, in some cases the losses are substantial - in one case as high as 12% of the firm's equity.[20] While a loss of ten percent or more of the equity of a publicly traded company would be an extreme event in the stock market, we note that none of the firms in the sample appear to have large enough exposures to drive them to *insolvency* when another financial firm fails.

[20] Note that the bankruptcy of a commercial bank involves exposures that are very small, but when a commercial bank is a creditor its losses are a higher fraction of its equity.

It may be that one single bankruptcy is not sufficient to drive a creditor into distress, but that financial institutions are interconnected in such a way that several failures would trigger a collapse. We consider this mechanism by aggregating the claims of each creditor across all the bankruptcies in the sample. Panel F shows that the results of this test: Even aggregating claims for each creditor in our database, the claims only average about $84 million, or about twice that of the average amount per creditor shown in the upper rows of the table ($53.4 for financial institutions in Panel B and $46.3 for publicly traded creditors in Panel C). Indeed, we find that creditors usually are involved in no more than two bankruptcies.[21]

The data in Panels A – F of Table III suggest that exposure to a bankrupt financial firm is typically too small to wipe out the equity of a counterparty, even if all of the exposures across several failures are aggregated together for each creditor.[22] This provides evidence against H1 that financial firm bankruptcies would cause other financial firms that are creditors to file for bankruptcy.

Next, we explicitly test H1 for the existence of cascades of failures from counterparty risk. To do so, we calculate the number of firms that enter distress or file for bankruptcy after suffering losses as creditors in another firm's bankruptcy. The 90 firms with creditor information (the 88 bankruptcies in Table III, AHM and AIG) have 287 publicly traded creditors that potentially could create a cascade of failures. We check for subsequent troubles using CRSP delisting codes, bankruptcydata.com, and Lexis-Nexis, and find the following 21 firm-events: 12 of the 287 creditors subsequently filed for bankruptcy protection in the U.S. and 1 in Canada, 2 were acquired in distress, and 6 entered distress.

Only 4 of the 90 firms with creditor data could be considered the trigger for a cascade of failures, as no other firm had creditors that subsequently went bankrupt or entered distress. Of these 4, 2 bankruptcies account for 19 of the 21 firm-events (AHM and Lehman). AHM's bankruptcy preceded the collapse of Lehman, which was one of AHM's 40 largest unsecured creditors, and Lehman's bankruptcy led to losses for 12 other creditors that subsequently failed or became distressed. Lehman's exposure of AHM was related to repos with a face value of about $84 million and Lehman failed more than a year after AHM went bankrupt in August 2007. Therefore, we conclude that AHM did not cause Lehman's failure. Thus, there are no instances where one bankruptcy in the sample caused a second bankruptcy that then caused a third bankruptcy, which contradicts H1.

Further evidence against H1 is the timing of the 21 firm-events. The average time to distress or bankruptcy among the 21 potential instances of counterparty contagion is 14.4 months, which indicates

[21] The firm with the most claims in the sample is Goldman Sachs, which is involved in four bankruptcies over a three year period. However, the aggregate loss was only 5.53% of Goldman's market value. This figure does not include Goldman' exposure to Lehman reported in Epiq, which is likely overstated, as described below.

[22] We consider the exposures of larger firms such as Lehman and AIG as a robustness check in section 3d.

that the second round of bankruptcies and/or distress typically occurred too late to be considered an immediate consequence of the first failure. AHM filed for bankruptcy in August 2007 and six of its creditors subsequently failed or required a bailout, but only Countrywide and WAMU became distressed in 2007. Of the 12 firm-events related to Lehman, none filed for bankruptcy or became distressed in September 2008 while four firms (Phoenix Cos., ABN-AMRO, Royal Bank of Scotland, and Nortel Networks) became distressed or went bankrupt in the first quarter of 2009 due to other losses.[23] All other Lehman creditors in the sample of 287 firms filed for bankruptcy or became distressed at least six months after Lehman collapsed. Thus, our test of H1 also indicates that Lehman was not a bankruptcy that led to a cascade of bankruptcies.

b. Counterparty contagion and stock market returns of creditors

Next we investigate counterparty contagion with event studies that examine the creditors' stock returns on the bankruptcy date. Table IV, Panel A shows that creditors suffer significant losses as a result of the bankruptcies, with an average decline of slightly more than one percent (-1.09%, t=-2.16) over the [-2,2] window centered on the filing announcement. A significant fraction of the creditors experience a decline in value. While these findings are consistent with H2 in that they show significant counterparty contagion, the magnitude of the contagion effects is small. Financial firm creditors experience more severe market reactions by some metrics ([-1,1], day 0, and [-5,5]), but the magnitude is also modest. While interconnectedness among financial firms is often cited as a major factor in the subprime crisis, counterparty contagion effects are not significantly larger among the bankruptcies that occurred after 2007.[24]

We consider multivariate analysis of creditor CARs in Panels B and C of Table IV. Panel B presents summary statistics on the variables used in the regression while Panel C reports regression estimates. Panel B shows that the exposure measured as a fraction of total assets averages 0.93%, which reflects the diversification of the creditor firms. The average creditor asset base is large, at about $326 billion, but the median is markedly smaller, even compared to the bankrupt firms. The largest creditor is Royal Bank of Scotland, a Lehman creditor, with $3.77 trillion in assets. The mean exposure is much higher when expressed as a fraction of the market value of the creditor's equity, but at 2.67% is fairly small, and the median is 12 basis points (bp). The mean volatility is 3.03% and the mean equity correlation is 0.24.

[23] Indeed, the only firm to file for bankruptcy as a direct result of Lehman's failure during the last half of 2008 was Reserve Primary Fund (RPF). RPF is a private firm and therefore not among the 287 creditors examined. Fisch and Roiter (2012) note that "the RPF loss was a rather modest one: the fund ultimately lost less than 1% of its overall value." Also, see Fitzpatrick and Thomson (2011).

[24] In untabulated results, we conduct tests of the mean and median CARs over different event windows in order to compare the whole sample and the subsample after 2007. We do not find any statistically significant differences between the two samples.

About a quarter of the claims are related to derivatives. More than half of the CARs are from recession periods, reflecting the large number of financial firm bankruptcies during the subprime crisis and the credit crunch of 1990-1991.We rely on the NBER to date economic recessions.[25]

Panel C of Table IV shows estimates from regressions that explain 5-day CARs (models (1)-(4)) and 2-day CARs (models (5)-(6)) as a robustness check. Supporting H2, we find that firms with higher counterparty exposures have more negative CARs. In the models (1), (2) and (5), we measure exposure as a percentage of the creditor's assets whereas in the other models claims are scaled by the equity of the creditor. In all specifications, the results indicate that the more a creditor is owed, the more its stock price falls. In models (2) and (4) we restrict the sample period to 2007-2010 and find that the coefficients in the later period are similar to those for the earlier years. The regressions in Panel C of Table IV control for the sizes of bankrupt firms and creditors, as well as derivatives usage to test H2's prediction that the impact of counterparty contagion is greater when the bankruptcy involves a large complex financial institution. We do not find significant coefficients on the debtor's size in any specification. In contrast, we find that creditors with derivatives-related exposures experience more negative reactions than those with other claims, consistent with the view that complex financial institutions impose greater costs on the system when they fail. Derivatives claims that are large have an even greater negative impact on the stock returns of the creditor, as shown by the significance of the interaction term. These results hold while controlling for equity return correlations, which may serve as a proxy for a common factor in the firms' portfolios. Equity correlation is positive and significant in the last two models, suggesting that losses facing creditor stockholders are not likely due to common factors.

Based on Merton (1974), a creditor that has unusually highly asset volatility and leverage should be more likely to default on its debt. Thus, direct exposure to a failing counterparty is more likely to push a firm over the default boundary if the creditor is highly levered or its profits are highly volatile. Volatility has the correct sign and is significant for both stock price reaction metrics. Leverage also has the correct (negative) sign and it is significant in Model 1 and 2.

We find that contagion effects are weaker for commercial bank creditors, as shown by the positive coefficients on the commercial bank creditor dummy variable (and significant during the 2007-2010 subsample). The weaker contagion effect is likely a result of diversification rules imposed on commercial banks. Finally, bankruptcies that occur in a recession should lead to stronger contagion effects but we find that the recession indicator is not significant.

[25] http://www.nber.org/cycles/cyclesmain.html.

c. Information contagion and stock market returns of rivals

Next, we investigate information contagion with event studies related to the bankrupt firm's competitors (excluding firms that are creditors). Table V shows that, unlike Lang and Stulz (1992), there is no significant impact on rivals upon the announcement of a financial firm bankruptcy filing. None of the event windows exhibits a significant negative return nor is any single day return statistically different from zero.

There are thousands of commercial banks with the same 4-digit SIC code, but they often operate in vastly different geographic markets. To identify the firms for which information from a bankruptcy or distress event will be most relevant, we form portfolios of firms that operate in the same state (and, therefore, which are more likely to be exposed to common regional factors). Table V shows a day [0, 1] impact of -0.64% (t-statistic of -1.67) for these 96 bankruptcies; the CARs for longer windows are also significantly negative.

Likewise, information contagion may be more apparent among competitors that are also focused on real estate. Table V shows 89 bankruptcies involving RE firms and this group's rivals exhibit significant negative stock market reactions as well. The day [0, 1] return is significantly negative (CARs are -0.67%) and the longer windows also have significant negative t-statistics. However, when we narrow the set of competitors down further, by requiring both similar geographic markets and a focus on real estate, the estimates are not significant. In untabulated results, we find similar CARs for all of the four categories in Table V when we restrict the period to 2007-2010.

Information contagion may not be important on the day of a bankruptcy filing if negative information has been incorporated into rivals' stock prices in prior months. Further, the bankruptcy sample may not reveal as much information to the market as the distressed firm sample if it does not include TBTF banks. Hence, in Table VI we show event studies of information contagion for the 149 distressed firms on their worst stock return days (see Hertzel, Li, Officer and Rodgers (2008)). The excess return on day 0 is -0.63% and nearly two-thirds of the portfolio has a negative return. The longer windows also show significant negative contagion effects. The greater stock market reaction on distress days compared to bankruptcy dates is consistent with the theory in Pastor and Veronesi (2012) and the empirical finding of Jorion and Zhang (2007) that contagion effects are larger for CDS spread jumps than for bankruptcy announcements. The results may also reflect the fact that the distressed firms are still days away from resolving their defaults, reducing the impact of competitive effects (see Zhang (2010)).

As with the bankrupt firm sample, we split the sample to determine how information affects the subset of rivals with similar locations and business lines. The results in Table VI show that reactions are stronger for firms that are in the same state as the distressed firm (the average day [0, 1] CAR is -1.30%, which is statistically different from -0.39% for the overall sample, and the [-2, 2] CAR of -2.85% is also

greater in magnitude, statistically speaking). Nearly 70% of the firms have negative returns in [-2, 2], which is significantly more than would occur randomly (sign test statistic=3.347). Our sample of distressed firms includes 82 financial institutions that suffered from RE losses. Their peers also exhibit the effects of information spillovers with an average return of -1.05% over [0, 1] and -2.56% for the [-2, 2] event window and negative returns for more than 70% of the firms (sign tests for both windows are significant at the 1% level). When we restrict the portfolios of rival firms' stocks to include those of competitors in the same state and the same line of business, the day [0, 1] CAR is -2.86% and the CARs over longer windows have magnitudes that exceed 3%. The two columns on the far right of Table VI show contagion effects for distressed firms during 2007-2010. The average CARs range from -1.51% to as low as -9.84%. Taken together, the results in Tables V and VI suggest that other firms in the industry suffer from strong contagion effects when they are located in the same state or engage in similar business, as predicted by H3.

Information contagion effects are investigated in further detail in a multivariate regression of the rival firms' CARs. For each type of event, bankruptcy or distress, we form portfolios based on whether the stocks are in the same state, RE, or both. We control for the size of the troubled firm, the likelihood of default of the peer firm, equity return correlations, a dummy variable for recessions and a measure of industry concentration (to control for competitive effects as predicted by H4). Summary statistics for the explanatory variables are reported in Table VII.

Table VIII shows that portfolios formed by location and/or business have significantly lower returns than those of other firms in the same 4-digit SIC code. In addition, the regressions indicate that the positive competitive effects are small - the Herfindahl measure is only significant in two of the regressions for the bankruptcy sample. Negative news about bankruptcy appears to have a more pronounced impact on peers in recessions according to models (1) and (3), but the coefficients are not significant for the distressed firm sample.

Given that our tests of information contagion show that it is significantly negative for the relevant firms, we revisit the results on counterparty contagion by examining industry-adjusted excess returns to determine if they also reflect information effects. In unreported results, we find that the impact of bankruptcy on creditors is largely due to counterparty contagion since the creditors' excess returns over the industry are about equal to the excess returns over the market. For example, the average industry-adjusted portfolio return is -1.05% over the [-2, 2] window, which is almost the same as the -1.09% return over the five day window found in Panel A of Table IV.

d. Case Studies of Lehman and AIG

Many of the bankruptcies in the sample involve smaller firms because TBTF policy implies that larger banks will be bailed out. Next, we present evidence on Lehman and AIG to determine the extent to which contagion involving TBTF firms differs from the contagion exhibited in the overall sample.

Lehman

In addition to being a very large firm whose bankruptcy is informative about TBTF, Lehman has the advantage of having more detailed information on claims in the Epiq dataset. [26] Panel A of Table IX shows creditor exposures for Lehman. Note the largest claim by a publicly traded creditor in Table IX is larger than the largest comparable claim in Table III, even though Table III includes data on Lehman. The reason is that the claims in the Epiq dataset are filed by creditors, some of whom ask for compensation on losses related to derivatives contracts and such claims are disputed.[27] We discuss the derivatives in more detail below, but note that despite their size, the largest claims against Lehman (and the majority of the money) are filed by trustees, as is commonly the case among the firms in Table III. Outside of the trustees, the claims are mostly quite small: The median claim is less than $5 million and the mean is $32 million.

Lehman also exhibits a high degree of interconnectedness if the number of financial firm creditors is used as the metric. Claims made by publicly traded financial firms are substantially above average, with a mean claim size of $347.1 million. This result is driven by the average size of derivatives contracts ($162.9 million) and claims that combine bonds with derivatives ($1,258.9 million). However, these figures are exaggerated for two reasons: First, the derivatives claims are overstated, because they fail to adjust the costs for netting. Second, many of the bond claims overstate the true loss from exposure to Lehman because they involve lawsuits about securitization or guarantees from Lehman subsidiaries that did not default.

[26] There are more than 6,500 claims for Lehman, which we obtain from the Epiq. In contrast, the data in Table III (based on 88 bankruptcies, including that of Lehman) is based on the largest unsecured creditors listed in the bankruptcy petition, which typically number about 20.

[27]The International Swap Dealers Association (ISDA) master agreement (and federal bankruptcy law) leads to the following outcome in Chapter 11 cases: The counterparty of a bankrupt firm that has an ISDA contract chooses whether to continue with the derivative or terminate it. If terminated, the creditor may keep whatever collateral had been posted. If the collateral is insufficient, the creditor files a proof of claim for the remainder. The amount is listed among the debtor's unsecured claims and may include the cost of acquiring a replacement contract. These claims appear in the Epiq data as "early termination agreement" claims and are estimates (made by the creditor) of the losses incurred at the time of the bankruptcy filing.

According to Cameron (2011), the derivative claims overstate losses because each derivative loss is affected by the bid-ask spread rather than netted and then adjusted for the bid-ask spread.[28] Evidence to support this view is the fact that when the Lehman estate disputed many of the derivatives claims, its largest counterparties agreed to substantially revise their claims downward.[29] Scott (2012) finds that claims filed against Lehman and its affiliates are approximately four times higher than they should be.

Even if the derivatives claims were unbiased estimates of the losses, they are small relative to the creditor's total assets. Panel A of Table IX shows that exposures among public financial firms are typically only .1% of assets and still only .2% among the financial firms with large derivatives claims. In results not shown, we find that no commercial bank creditor was at risk of losing as much as 1.5% of assets as a result of Lehman's failure. Among the publicly traded financial creditors, 93.2% have an exposure that is below 1.5%.[30] A t-test for whether the proportion of such firms with exposures is greater than 1.5% is rejected with a test statistic of 5.9. The largest exposures as a percent of assets are found among nonfinancial firms, which are less often regulated and therefore under less pressure to diversify their assets. In addition, they may find it optimal to have large exposures to other firms as suppliers or customers. Thus, as many as a quarter of the industrial creditors of Lehman have claims that exceed 1.5% of assets and a t-test for whether the mean exposure exceeds 1.5% cannot be rejected. While the mean exposure is greatest among this group, it nonetheless only accounts for 4% of their assets on average and the median exposure is only 0.1% of assets. The largest of the exposures, 90.4%, belongs to 4Kids Entertainment, a toy company that lost money when it invested its working capital in auction rate securities on Lehman's advice and subsequently sued.[31] In dollar amounts, the largest claim by a nonfinancial firm belongs to Dynergy, an active participant in the energy derivatives market.

We also investigate the exposures as a fraction of the market value of the equity of the creditors. The 110 financial creditors are owed 4.7% of their equity on average and the median is only 1.1%. While these exposures to Lehman are small, they are larger than those for the sample as a whole (Table III). This

[28]For example, if a creditor has two CDS contracts with Lehman, one where it is betting that Ford will default and another betting that Ford will not default, then the net claim is zero and the creditor bears no cost in replacing the position. In contrast, the claims filed by creditors may use each contract's replacement value (using low bid prices that result from the turmoil in the CDS market). If so, the claim would inflate the replacement costs of derivatives.

[29]Summe (2011) discusses the derivatives claims in the case of Lehman and notes they were a major source of recovered assets for Lehman, reaching nearly $9 billion. This recovery reflects in large part an agreement among Lehman's "big bank counterparties" to reduce the claims associated with early termination agreement losses.

[30] The largest exposure among these firms belongs to GLG Partners, a hedge fund started by Lehman that went public in 2007 and was 25% owned by Lehman in September 2008.

[31]4Kids suffered the losses in summer 2008 and filed suit shortly thereafter. The claim was for losses of $31.5 million in principal, interest of 9% and treble damages of about $95 million.

could reflect the fact that many financial firms' market capitalizations had declined substantially by the time of the Lehman bankruptcy or that the exposures are greater than the typical exposure in Table III. The test statistics for whether the fraction of equity exposed to Lehman is above 15% are 8.5 for financial creditors and 5.0 for nonfinancial creditors, respectively, indicating that creditors in Lehman's bankruptcy are also well diversified. These findings support Scott's (2012) conclusion that interconnectedness was not the primary driver of systemic risk after Lehman failed. As mentioned earlier in the analysis of potential cascades, none of Lehman's publicly traded creditors entered bankruptcy as a result of losses related to their bankruptcy claims.[32]

AIG

A second large firm in our study, AIG, was undoubtedly a TBTF firm when it became distressed in fall 2008. Its major creditors were the subject of Congressional testimony and this fact allows us to investigate its potential for counterparty contagion. The data for AIG includes 51 claims owed to 29 firms, including 39 claims owed to19 publicly traded financial firms with data on Compustat and CRSP (most of the other 10 are foreign banks). AIG's creditors have much larger dollar value exposures than any of those reported for Lehman, which supports the government's claim that AIG would have had a greater impact on the financial system. Panel B of Table IX shows that the majority of the exposures involve banks, further bolstering the view that AIG was systemically important. The largest exposures involve capital markets instruments, such as CDS, repurchases and CDOs. However, scaled by the size of the counterparties' assets, exposures are quite small and none exceed 1.5% percent of the creditor's assets. Typically, the potential losses are no more than a half percent of assets. Measured by the market value of equity, the claims are substantially higher and the table shows that the exposures as a fraction of the market value of equity of the creditor are sometimes as high as 27%. Nonetheless, the loss of equity would not be sufficient by itself to push any AIG counterparty into bankruptcy.

The event study results in Tables IV suggest counterparty contagion effects are modest, which may be due to TBTF policies. We consider the role of TBTF by examining creditor stock returns related to Lehman and AIG. In Table X we investigate the impact of days with important negative news announcement: For Lehman, we investigate six dates in 2008: March 14 (the Bear Stearns deal), June 2

[32] A possible concern with this finding is whether a cascade of failures was avoided when the Fed intervened to stabilize markets. Since the exposures were quite small at the time of the bankruptcy, intervention would not have been necessary for survival. Moreover, few of the institutions that received large bailouts in fall 2008 were listed as unsecured creditors in the Chapter 11 filing. Of the nine financial institutions that received $125 billion in TARP capital in October 2008, only Citigroup and BONY were listed by Lehman as unsecured creditors in its Chapter 11 filing and both only as trustees for bondholders. While seven of the nine (Wells and BONY were the exceptions) were derivatives creditors that subsequently filed proofs of claims, the claims only totaled $10 billion and they were reduced sharply as part of the Big Bank Counterparties settlement (see footnote 29). AIG, which received an $85 billion bailout in September 2008, was not a Lehman creditor.

(ratings downgrade), June 9 (announcement of major losses), August 19 (secret talks to raise capital stall), September 11 (news about a search for a buyer) and September 15 (bankruptcy). For AIG, we examine four earnings announcement dates between 2007 and its bailout in September 2008, each with a negative earnings surprise, and the two dates involving financial problems at AIG (February 11, 2008 and September 15, 2008) analyzed by Egginton, Hilliard, Liebenberg, and Liebenberg (2010).[33]

In Panel A we show that the stock returns of Lehman's creditors are significantly negatively affected by the events. The point estimates for the five day announcement window are nearly double those of the full sample reported in Panel A of Table IV. The stock returns of Lehman's creditors fall by 1.24% on average over [0, 1] with a t-statistic of -3.33. The largest negative returns occur on September 11, 2008, with the event day AR of -1.42% and the 3-day CAR of -3.09% (t=-2.94). Much of the creditor portfolio response occurs within the financial firm creditors, despite the fact that Panel A of Table IX shows that nearly all of their claims are less than 1.5% of assets. Compared to the 4.7% mean exposure as a fraction of equity, the declines in the counterparties' market values are high, which could be due to information about the loss of future business (i.e., more than the loss associated with bankruptcy claims). As shown in the rightmost two columns, the firms with the largest exposures, whether measured by assets or market value of equity, have the largest stock market reactions to the bankruptcy filing and their stock prices fall by as much as 3.87% over the five day announcement window.

The collapse of AIG had an unusually large impact on its counterparties. Panel B of Table X shows that for AIG's creditors, the effect over the five day announcement window is -4.24%. The returns are noticeably lower for the creditors with higher exposures. These six event days' losses caused an average cumulative loss of nearly one-quarter of the equity of AIG's creditors, including a loss of more than 10% around the distress day in September 2008.[34] After AIG's bailout, creditors experienced huge positive abnormal returns (8.63% on day 1 and 9.53% on day 2, not tabulated), which is also consistent with a major role for counterparty contagion.

e. Robustness Checks

In this section we provide additional tests related to the event study methodology, the information set available to investors at the time of distress, and counterparty exposures reported in SEC filings.

An alternative event study methodology for the counterparty contagion analysis in Table IV would be to substitute individual creditor stock returns for portfolios of firms. As a robustness check, we treat each creditor firm separately and calculate the average AR and CAR across creditors. In unreported results, we find that this approach yields estimates of counterparty contagion effects that are slightly larger: rather than an average return of -1.05 over the [-2, 2] event window, the return is -2.29% (t=-4.37)

[33]Lehman reported losses in advance of earnings releases, so its announcement dates are less informative.

[34]AIG's distress day is also the Lehman's bankruptcy day.

and if we restrict the sample to financial creditors the average is -2.43% (t=-3.70). We also repeat these event studies using the Fama-French and the 4-factor models to calculate excess returns and we find that the (unreported) results are similar.

A second robustness test examines the effect of investor awareness. It is possible that the stock market reaction to a bankruptcy filing is muted because investors are unaware of the exposures and the risk associated with them. For this to be true, the counterparty's shareholders would have to be unaware of the counterparty relationship even after the company files its bankruptcy petition listing the names and amounts owed to its largest unsecured creditors. The fact that so many companies reported the true nature of their Lehman exposures to the Wall Street Journal (the basis of the Dow Jones report used by Jorion and Zhang (2012)) suggests that investors were aware of the exposures from the bankruptcy filing. But, investors may be less informed about the degree of interconnectedness of financial institutions in the case of distressed firms. To investigate creditors of distressed firms, we examine 10-K filings, which are required to report material business relationships. If the distressed firms could cause significant losses on suppliers, customers or other firms, the affected parties should list this risk in their SEC filings. Following Fee and Thomas (2004) and Hertzel, Li, Officer and Rodgers (2008), we identify relationships using the Compustat segment files from 1979-2010 and match the names of the customers and suppliers to the sample of bankrupt and distressed firms to determine the extent of potential trouble along the supply chain.

Few of the bankrupt firms' names are listed as major customers or suppliers in Compustat. Five companies list one bankrupt firm as important customers in their 10-K forms, but none were involved in derivatives trading or interbank lending and instead were involved through securities issuance.[35] Material risks could also involve firms that list the bankrupt firms as suppliers, but they are equally rare. Of these, only AHM's SEC filings suggest an important supplier-customer relationship with financial firms in the crisis period.

The distressed firms are typically larger than the bankrupt firms and they are more often listed as important customers in the SEC data. We find 40 of the distressed firms are listed as important sources of revenue for 133 firms in a total of 373 reports, but these firms are rarely connected through capital market transactions.[36] Of the 118 instances where a distressed firm is listed by a financial firm, only 17 are in SEC filings after 2006 and these more often involve insurance companies. We also investigate our distressed firms to check whether they disclose business relationships with financial firms in their SEC

[35] Three were nonfinancial firms while Clayton Holdings worked on due diligence in the issuance of Lehman MBS and Vornado is a REIT that had Lehman as a tenant.

[36] For example, the 40 distressed firms include AIG, Citigroup, Bear Stearns, and Royal Bank of Scotland but none of these four firms is listed by a major financial firm near the time of the crisis.

filings, but only three firms do and these are all mortgage originators that sell to Bank of America, Wells Fargo and Fannie Mae for MBS issuance. We do not find significant equity valuation effects along the supply chain for bankrupt and distressed firms (results are not reported for the sake of brevity). In sum, these results also indicate that the potential for counterparty contagion to cause a cascade of financial failures is small.

4. Conclusion

The recent financial crisis is often connected to the collapse of Lehman, suggesting that bankruptcy by a large financial firm typically generates negative externalities for counterparties and for industry peers. Early studies of the spillover effects of bankruptcies, which were mainly based on samples of nonfinancial firms, focused on the information contagion channel. While the same effects could be equally important when financial firms become distressed, the recent financial crisis has focused researchers' attention on the potential for counterparty contagion. If counterparty contagion is a major factor in cases of distressed financial firms, then bailouts for creditors may substantially reduce the adverse impact of a bankruptcy.

Counterparty contagion is stronger for firms with larger and more complex exposures and higher equity return volatilities, while it is weaker for commercial banks. The counterparty contagion effect is generally limited in magnitude, which owes to the fact that most counterparties have rather small exposures to the bankrupt companies. The largest exposures, revealed in the list of the largest unsecured creditors in the bankruptcy petition, often belong to the trustees of publicly traded bonds and since these bonds are widely held, the exposure of a single financial firm is substantially smaller. Other creditors are often financial firms, but they are rarely at risk of failing as a result of another firm's troubles because they invest in diversified portfolios, as is often required by regulation. Our results indicate that strictly enforcing diversification regulations is an effective way to mitigate systemic risk.

Information contagion is also significant in financial firm failures. The effects are more pronounced for rivals that operate in similar geographic locales and in the same line of business. Therefore, we conclude that analysis of information contagion requires considerable detail about the set of firms for which the information is most relevant. Information contagion is strongest in samples of distressed firms, suggesting that information is known to investors well before bankruptcy.

Overall, our results suggest that clustering of financial firm troubles reflects both counterparty relationships among financial institutions and the similarity of financial firms' business models.

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Table I

Distribution of Bankruptcy and Distress Events in Sample

The sample is from 1981 to 2010 and includes financial firm bankrupties and distress events with industry portfolio information on CRSP and COMPUSTAT. Industry SIC code and locations are obtained from Compustat. Distressed firms are in the bottom 5% of CRSP firms ranked by prior 3 year stock returns. Firms in real estate are those described as such in Businessweek and Compustat.

Panel A: Number of Events by Year

Year	Bankruptcies	Distress
1981	1	0
1982	0	1
1983	0	0
1984	0	2
1985	0	0
1986	1	0
1987	0	4
1988	4	4
1989	8	4
1990	10	6
1991	7	9
1992	2	5
1993	4	1
1994	1	3
1995	3	2
1996	0	0
1997	3	0
1998	7	1
1999	4	3
2000	6	6
2001	6	7
2002	6	16
2003	3	7
2004	1	4
2005	3	3
2006	2	3
2007	7	15
2008	10	28
2009	25	12
2010	18	3
Total	142	149

Panel B: Number of Firms by Industry

Industry		Bankruptcy	Distress
Depository Institutions			
Commercial Banks	6020	34	47
Federally Chartered Thrifts	6035	11	17
Other Thrifts	6036	8	10
Non-depository Credit (Finance Companies)			
Government-sponsored Enterprises	6111	0	5
Personal Finance Companies	6141	10	2
Business Finance Companies	6153	2	0
Captive Finance Companies and Others	6159	4	2
Mortgage Bankers	6162	11	4
Leasing Companies	6172	3	0
Securities Firms			
Brokers and Dealers	6200	1	0
Investment Banks	6211	8	5
Investment Advice	6282	2	3
Insurance Companies			
Life Insurers	6311	4	14
Accident and Health Insureres	6321	1	2
Hospital and Medical Plans	6324	0	1
Property and Casualty Insurers	6331	9	8
Surety Insurance Firms	6351	2	5
Title Insurance Firms	6361	1	0
Insurance Agents	6411	3	3
Real Estate			
Real Estate Operators	6510	2	0
Commercial Property Operators	6512	2	1
Apartment Building Operators	6513	1	0
Real Estate Dealers	6532	3	0
Land Developers	6552	3	0
Financial Holding Companies			
Real Estate Investment Trusts (REITs)	6798	16	18
Miscellaneous Financial Holding Companies	6799	1	2
	Total	142	149

Panel C: Distribution of Events by State

Location	Bankruptcy Sample	Distress Sample
California	36	20
New York	24	26
Texas	15	10
Florida	12	9
Illinois	7	6
Georgia	5	1
Alabama	4	1
Arizona	3	3
Kansas	3	0
North Carolina	3	0
Washington	3	3
Pennsylvania	2	6
Virginia	1	5
Puerto Rico	1	5
Connecticut	0	4
Ohio	0	4
Massachusetts	0	3
DC	0	3
Wisconsin	0	3
Other State	23	16
Foreign	0	21

Panel D: Number of Firms in Real Estate Business

	Number	Percentage
Bankrupt firms	94	66.2%
Distressed firms	83	55.7%

Panel E: Total Assets of Event Firms ($ millions)

	Mean	Median	Max	Min
Bankrupt firms	12231	1066	691063	0
Distressed firms	73243	11701	1706787	3382

Table II

Samples of Affected Firms

For each bankruptcy and distress case, we form portfolios of stocks in the same 4-digit SIC code (rivals) or creditor stocks. Rival states are obtained from Compustat. "In RE" is an indicator variable for firms with business in real estate, as described by Compustat or Business week. Trustees are identified from bankruptcy filings.

	Industry Rivals				
	Number of Events	**Mean Portfolio Size**	**Median Portfolio Size**	**Max Portfolio Size**	**Min Portfolio Size**
Bankrupt Firms					
Firms with rivals in the same industry	142	109	41	392	1
Firms with rivals in the same industry & same state	96	10	6	46	1
In RE with rivals in the same industry	94	128	78	375	1
In RE, with rivals in same industry & that are in RE	89	131	89	361	1
Distressed firms					
Firms with rivals in the same industry	149	100	59	354	1
Firms with rivals in the same industry & same state	84	6	4	34	1
In RE with rivals in the same industry	83	94	59	354	2
In RE, with rivals in same industry & that are in RE	82	90	61	352	1

	Creditors				
	Number of Bankruptcies	**Mean**	**Median**	**Max**	**Min**
Bankrupt Firms with Data on Largest Creditors	88	20	20	100	2
Trustee Creditors	41	5	2	57	1
Non-Trustee Creditors	87	18	18	94	1
Financial Firm Creditors	79	6	5	33	1
Publicly Traded Creditors	62	4	3	20	1
With a 4-digit SIC Unlike the Bankrupt Firm's	62	4	3	18	1

Table III

Debt Owed to Unsecured Creditors

The table reports statistics on the amount owed to unsecured creditors for sample firms with available data. Claims are reported by the bankrupt firm in its initial Ch. 11 filing. Debt and assets of publicly-listed creditors are obtained from Compustat. Market value of equity of creditors is from CRSP.

Panel A. Aggregate debt amount per bankruptcy ($mm)

	N	Total	Mean	Median	Max	Min
All Bankruptcies	88	256,459.2	2,914.3	77.6	157,917.0	0.1
With Trustee Creditors	41	226,647.7	5,528.0	143.1	155,000.0	0.2
With Non-Trustee Creditors	87	29,811.5	342.7	40.1	3,729.9	0.0
With Financial Firm Creditors	79	27,197.0	344.3	14.9	3,514.9	0.0

Panel B. Amount owed to financial institution creditors

	No. Of Event-Creditor Obs.	Total	Mean	Median	Max	Min
Bankrupt Companies	509	27,197.0	53.4	3.7	1,987.5	0.0
Commercial Banks	72	548.4	7.6	2.5	79.1	0.0
Other Financial Companies	437	26,648.6	61.0	4.0	1,987.5	0.0

Panel C. Claims made by publicly-listed creditors

	No. Of Event-Creditor Obs.	Total	Mean	Median	Max	Min
Bankrupt Companies	242	11,216.2	46.3	1.0	1,934.7	0.0
Commercial Banks	21	27.6	1.3	0.4	7.7	0.0
Other Financial Companies	221	11,188.6	50.6	1.1	1,934.7	0.0

Panel D. Claims as a fraction of assets of publicly-listed creditors

	No. Of Event-Creditor Obs.	Mean	Median	Max	Min	% (<1.5%)
Bankrupt Companies	242	0.05	0.002	1.307	0.0	100.0
Commercial Banks	21	0.13	0.002	1.307	0.0	100.0
Other Financial Companies	221	0.04	0.002	1.269	0.0	100.0
Commercial Bank Creditors	71	0.03	0.004	1.269	0.0	100.0
Other Creditors	171	0.06	0.002	1.307	0.0	100.0

Panel E. Claims as a fraction of market value of equity of publicly-listed creditors

	No. Of Event-Creditor Obs.	Mean	Median	Max	Min	% (<15%)
Bankrupt Companies	242	0.24	0.012	12.300	0.0	100.0
Commercial Banks	21	0.14	0.006	1.045	0.0	100.0
Other Financial Companies	221	0.25	0.014	12.300	0.0	100.0
Commercial Bank Creditors	71	0.32	0.040	12.300	0.0	100.0
Other Creditors	171	0.20	0.006	5.535	0.0	100.0

Panel F. Debt owed per creditor across all bankruptcies

	No. Of Event-Creditor Obs.	Mean	Median	Max	Min
Total debt per creditor	133	84.33	0.8	1,949.4	0.0
Total debt/assets per creditor	133	0.09	0.008	1.307	0.0
Total debt/equity per creditor	133	0.44	0.019	12.300	0.0

Table IV

Panel A: Counterparty Contagion and Creditor Stock Returns

Abnormal equity returns (AR) and cumulative abnormal returns (CAR) are calculated for the creditor portfolio (N=62) around day 0, the date when a firm filed for Chapter 11 bankruptcy. The creditor portfolio return is constructed by equally weighting equity returns of all publicly-listed unsecured creditors disclosed in the bankruptcy filing. The returns are averaged across events. AR (CAR) is the market-adjusted cumulative abnormal returns (in percent) of the creditor portfolio, using the market model over the period (-250, -50). The market return is proxied by the CRSP value-weighted index. Statistical significance for ARs (CARs) is tested following MacKinlay (1997). The heading "% (<0)" refers to the fraction of observations with negative or zero values. The statistical significance of this fraction is based on a generalized sign test. The superscripts ***, **, and * indicate significance at 1%, 5% and 10% levels, respectively.

	Creditor Portfolio CAR (N=62)			**Financial Creditor Portfolio CAR (N=50)**			**Bankrutpcy After 2007 (N=34)**		
Day	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**
-5	0.33	1.52	46.8	0.52	1.52	50.0	0.44	1.27	44.1
-4	-0.27	-0.99	60.3	-0.28	-1.13	52.2	-0.55	-1.27	64.5
-3	0.02	0.10	49.2	-0.01	-0.01	57.1	-0.02	-0.04	44.1
-2	-0.04	-0.17	52.5	0.47	1.01	49.0	0.02	0.07	57.6
-1	**-0.48*** **	-2.62	61.6*	**-0.50***	-1.68	59.2	**-0.54***	-1.87	63.6
0	-0.25	-0.94	53.2	**-0.91** **	-2.09	56.0	-0.33	-0.77	50.0
1	-0.13	-0.71	53.3	0.09	0.41	50.0	-0.12	-0.44	48.5
2	-0.23	-1.18	60.7*	-0.29	-0.95	68.0**	-0.24	-0.73	66.7**
3	-0.26	-0.92	58.1	-0.28	-0.55	54.0	-0.17	-0.34	47.1
4	0.11	0.36	48.3	0.10	0.19	52.1	0.24	0.49	42.4
5	-0.34	-1.38	66.7**	**-0.94** **	-2.25	73.9***	**-0.62***	-1.72	70.9***
0, 1	-0.37	-1.18	53.2	**-0.82***	-1.76	56.0	-0.44	-0.84	50.0
-1, 1	**-0.83** **	-2.51	58.1	**-1.31** **	-2.33	56.0	**-0.96***	-1.84	50.0
-2, 2	**-1.09** **	-2.16	64.5**	-1.14	-1.41	58.0	-1.17	-1.41	64.7**
-5, 5	-1.46	-1.63	61.3*	**-1.92** **	-2.07	70.0***	-1.75	-1.15	58.8

Table IV

Panel B: Summary Statistics for Cross-Section Regression Variables (N=314)

The sample includes creditors for firms in Table IV, Panel A and for AHM, Lehman and AIG. Exposure is measured either as a creditor's claim over its total assets or over the market value of its equity. Bankruptcy size and creditor size is total assets of the failed firm and creditor, respectively. Volatility is calculated using creditor equity returns during the 252 days preceding the event. Equity correlation uses equity returns of the failed firm and its creditor for 252 days preceding the event. Leverage is total debt over the sum of total debt and the market value of the creditor's equity, calculated as the average over the 4 quarters preceding the event. Derivatives claim indicator equals 1 if the claim includes derivatives, and zero otherwise.

Variable	Mean	Std Dev	Min	Median	Max
Exposure (% assets)	0.93	6.06	0.00	0.03	90.40
Exposure (% equity)	2.67	9.87	0.00	0.12	83.60
Bankruptcy size ($ b.)	352.20	336.73	0.00	327.91	691.06
Creditor size ($ b.)	326.35	604.39	0.03	38.26	3771.20
Volatility	3.03	1.68	0.76	2.71	12.36
Equity correlation	0.24	0.20	-0.16	0.22	0.72
Leverage	0.68	0.27	0.00	0.79	0.99
Claims are derivatives	0.24	0.43	0.00	0.00	1.00
Recession	0.61	0.49	0.00	1.00	1.00

Table IV

Panel C: Regression Explaining Creditors' Abnormal Equity Returns

The dependent variable, CAR, is the abnormal stock return from a market model for the creditor during the bankruptcy event window. Figures in parentheses are t-statistics based on clustered standard errors, which are robust standard errors adjusted for clustering by bankruptcy events. The superscripts ***,**, and * indicate significance at 1%, 5% and 10% levels, respectively.

	Expected Sign	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
		Day [-2, 2]	Day [-2, 2]	Day [-2, 2]	Day [-2, 2]	Day [0,1]	Day [0,1]
Constant		5.24	11.35**	4.17	9.52**	1.74	1.55
		(1.36)	(2.69)	(1.39)	(2.67)	(0.64)	(0.62)
Exposure (% of assets)	–	-0.06***	-0.06***			-0.19***	
		(-3.76)	(-4.90)			(-12.00)	
Exposure (% of equity)	–			-0.20***	-0.20***		-0.22***
				(-7.35)	(-9.68)		(-9.12)
Size of bankrupt firm	–	-0.25	-0.52	-0.18	-0.36	0.12	0.13
		(-1.18)	(-1.29)	(-0.89)	(-0.93)	(0.88)	(0.86)
Size of creditor	+/–	0.11	-0.12	0.01	-0.23	-0.14	-0.29
		(0.35)	(-0.55)	(0.01)	(-1.16)	(-0.68)	(-1.30)
Derivatives claim	–	-4.13***	-3.35***	-4.15***	-3.49***	-4.11***	-4.03***
		(-5.09)	(-6.36)	(-5.56)	(-7.02)	(-6.91)	(-7.20)
Derivatives claim * Exposure (% assets or equity)	–	-1.37***	-1.43***	-1.10***	-1.17***	-1.08***	-0.91***
		(-18.80)	(-25.62)	(-12.70)	(-16.54)	(-26.58)	(-22.80)
Leverage	–	-4.34**	-4.14*	-2.83	-2.48	-1.13	1.07
		(-2.40)	(-1.83)	(-1.63)	(-1.11)	(-0.79)	(0.85)
Volatility	–	-1.11***	-1.27***	-0.78***	-0.85***	-0.48**	-0.29
		(-3.27)	(-4.72)	(-2.76)	(-4.08)	(-2.09)	(-1.36)
Equity correlation	+/–	1.13	1.50	1.13	0.82	6.84***	7.11***
		(0.80)	(0.82)	(0.77)	(0.51)	(5.07)	(6.30)
Commercial bank creditor	+	3.43	6.28*	3.05	5.50*	2.34*	1.97*
		(1.24)	(1.88)	(1.20)	(1.78)	(1.86)	(1.92)
Recession	–	0.93	0.21	0.78	-0.33	-1.12	-1.19
		(0.47)	(0.10)	(0.40)	(-0.17)	(-1.24)	(-1.27)
R-square adj. (%)		10.72	11.29	13.15	13.79	14.86	18.52
P-value for F-stat.		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
No. of Obs.		314	236	314	236	314	314
Sample		Full Sample	2007-2010	Full Sample	2007-2010	Full Sample	Full Sample

Table V

Bankruptcy Filings and Information Contagion

The table presents abnormal equity returns (AR) and cumulative abnormal returns (CAR) for the industry portfolio when a firm filed for Chapter 11 bankruptcy over the period 1981-2010. The industry portfolio return is constructed by equally weighting equity returns of all firms in the same 4-digit SIC code for each bankruptcy event. The same state portfolio is consctructed as an equally-weighted portfolio of industry firms with headquarters in the same state. The same business portfolio is an equally-weighted portfolio with industry firms in the real estate business for bankrupt firms with real estate problems. We average these returns across events. AR (CAR) is the market-adjusted cumulative abnormal return (in percent) of the industry portfolio, using the market model over the period (-250, -50). The market return is proxied by the CRSP value-weighted index. Statistical significance for ARs (CARs) is tested following MacKinlay (1997). The "% (<0)" entry indicates the percentage of observations with negative or zero values. The statistical significance for this fraction is based on a generalized sign test. The superscripts ***, **, and * indicate significance at 1%, 5% and 10% levels, respectively.

	All Industry Portfolio			**Same State Portfolio**			**Same Business Portfolio**			**Same State and Same Business**		
	N=142			**N=96**			**N=89**			**N=57**		
Day	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**
-5	-0.04	-0.18	54.3	-0.04	-0.17	50.0	-0.19	-0.90	54.7	-0.35	-1.28	58.2
-4	-0.43	-1.84	49.3	-0.44	-1.47	56.7	**-0.506***	-1.75	52.9	-0.28	-0.66	54.7
-3	-0.29	-1.30	51.4	0.08	0.24	52.2	0.04	0.25	44.6	0.58	1.29	52.7
-2	0.38	1.60	42.6	-0.46	-1.22	57.0	0.19	0.97	41.9	-0.12	-0.56	55.4
-1	0.03	0.14	51.1	-0.44	-1.47	52.6	0.00	-0.02	53.4	0.07	0.24	49.1
0	-0.15	-0.66	54.9	-0.29	-1.05	57.3	**-0.69*****	-2.63	59.6	**-0.35**	-0.97	56.1
1	0.19	1.12	48.2	-0.36	-1.54	59.1	0.02	0.08	53.5	**-0.20**	-0.61	53.7
2	-0.27	-1.14	53.0	-0.08	-0.20	48.9	**-0.73*****	-3.04	59.5	-0.65	-1.48	51.0
3	-0.24	-1.11	54.3	0.36	1.34	46.2	-0.07	-0.33	53.5	0.48	1.54	44.4
4	0.02	0.06	51.8	-0.35	-1.60	60.2*	**-0.55*****	-2.68	64.2**	**-0.72*****	-2.84	58.8
5	0.38	1.76	40.3	0.04	0.16	48.9	-0.07	-0.31	48.2	-0.04	-0.14	50.9
0, 1	0.04	0.13	45.1	**-0.64***	-1.67	56.3	**-0.67****	-2.14	57.3	-0.54	-1.00	54.4
-1, 1	0.07	0.19	44.4	**-1.07****	-2.35	60.4*	**-0.67***	-1.89	58.4	-0.47	-0.79	47.4
-2, 2	0.18	0.37	43.7	**-1.59****	-2.35	54.2	**-1.13****	-2.37	53.9	-1.15	-1.47	54.4
-5, 5	-0.41	-0.63	53.5	**-1.91****	-2.06	58.3	**-2.39*****	-2.85	53.9	-1.41	-1.54	52.6

Table VI

Distress Days and Information Contagion

The table presents abnormal equity returns (ARs) and cumulative abnormal returns (CARs) of industry portfolios on the day a distressed firm experiences its largest single-day price decline over the period 1982-2010. All portfolio returns are equally-weighted and calculated with stock returns of firms in the same 4-digit SIC code. The same state portfolios and the same business portfolios further restrict the industry peers to those headquartered in the same state and in the real estate business, respectively. The returns are averaged across events. AR (CAR) is the abnormal (cumulative abnormal) return (in percent) of the industry portfolio estimated with the market model over the (-250, -50) period, where the market is proxied by the CRSP value-weighted index. "% (<0)" indicates the percentage of observations with negative or zero values and the fraction's statistical significance is based on a generalized sign test. ***,**, and * indicate significance at 1%, 5% and 10% levels, respectively.

	All Industry Portfolio		**Same State Portfolio**		**Same Business Portfolio**		**Same State and Same Business Portfolio**		**2007-2010 Same Business Portfolio**		**2007-2010 Same State and Same Business Portfolio**	
	N=149		**N=84**		**N=82**		**N=38**		**N=44**		**N=20**	
Day	**Mean (%)**	**% <0**	**Mean (%)**	**% <0**	**Mean (%)**	**% <0**	**Mean (%)**	**% <0**	**Mean (%)**	**% <0**	**Mean (%)**	**% <0**
-5	0.00	47.9	0.29	51.3	0.47	48.7	0.27	54.3	0.79	47.6	0.42	55.6
-4	-0.15	53.1	0.32	53.7	0.24	56.3	**-0.03**	67.6**	0.56	55.8	0.82	52.6
-3	0.09	51.8	0.21	48.1	0.42	46.8	**0.11**	44.4	0.51	42.9	0.28	38.9
-2	-0.12	60.3*	**-0.56****	62.2*	-0.41	65.8**	-0.40	70.3***	-0.35	65.1**	-0.76	73.7***
-1	-0.27	54.2	-0.27	58.5	-0.36	52.5	-0.15	57.9	**-1.24***	55.8	-0.08	50.0
0	**-0.63*****	66.4**	**-1.37*****	69.0***	**-2.04*****	76.8***	**-2.84****	73.7***	**-3.00*****	79.5***	**-4.61***	65.0**
1	0.24	54.4	0.05	57.8	**0.99****	56.1	**-0.03**	60.5*	**1.49***	50.0	0.39	60.0
2	**-0.40*****	61.8*	**-0.78****	55.6	**-0.78***	61.3*	**-1.11***	64.9**	-1.18	55.8	-1.41	57.9
3	-0.09	49.7	-0.25	56.1	0.13	50.0	-0.61	62.2*	-0.07	52.4	-0.85	73.7***
4	0.14	50.0	-0.50	59.8	0.57	45.0	-0.38	62.2*	0.89	42.9	-1.38	68.4***
5	-0.04	50.4	**-0.74****	66.7**	-0.07	60.3*	**-1.67****	74.3***	-0.27	61.9*	**-2.91****	78.9***
0, 1	**-0.39****	62.4*	**-1.30****	62.4*	**-1.05****	68.3***	**-2.86****	63.2*	**-1.51***	70.5***	**-4.22***	60.0*
-1, 1	**-0.65****	57.0	**-1.56*****	57.6	**-1.41***	59.8	**-3.01****	52.6	**-2.72****	61.4*	-4.30	50.0
-2, 2	**-1.15*****	65.8**	**-2.85*****	69.4***	**-2.56*****	70.7***	**-4.48*****	68.4***	**-4.22*****	72.7***	**-6.36****	70.0***
-5, 5	**-1.20****	69.8***	**-3.46*****	69.4***	-0.86	68.3***	**-6.67*****	73.7***	-1.91	70.5***	**-9.84****	75.0***

Table VII

Descriptive Cross-Sectional Statistics

Panel A: Bankruptcy Event Sample Partioned by State (N=193)

Variable	Mean	Std Dev	Min	Median	Max
Same_dummy	0.37	0.48	0.00	0.00	1.00
Bankrupt/distressed firm size ($ b.)	16	77	0	2	691
Equity correlation	0.09	0.16	-0.20	0.04	0.71
Rival volatility	2.08	1.83	0.00	1.73	15.35
Rival rating	14.56	2.38	5.00	14.40	21.00
Industry Herfindahl index	0.13	0.14	0.02	0.09	0.79
Recession	0.35	0.48	0.00	0.00	1.00

Panel B: Bankruptcy Event Sample Partioned by Business (N=110)

Variable	Mean	Std Dev	Min	Median	Max
Same_dummy	0.72	0.45	0.00	1.00	1.00
Bankrupt/distressed firm size ($ b.)	16	72	0	2	691
Equity correlation	0.11	0.17	-0.11	0.06	0.71
Rival volatility	2.14	1.56	0.00	1.83	7.82
Rival rating	14.21	2.33	7.00	14.00	21.00
Industry Herfindahl index	0.12	0.14	0.02	0.04	0.79
Recession	0.16	0.37	0.00	0.00	1.00

Panel C: Distress Event Sample Partioned by State (N=233)

Variable	Mean	Std Dev	Min	Median	Max
Same_dummy	0.34	0.47	0.00	0.00	1.00
Bankrupt/distressed firm size ($ b.)	71	200	1	12	1707
Equity correlation	0.38	0.24	-0.10	0.41	0.87
Rival volatility	1.63	1.18	0.00	1.19	6.27
Rival rating	14.40	2.21	6.00	14.47	23.00
Industry Herfindahl index	0.15	0.17	0.01	0.07	0.79
Recession	0.29	0.45	0.00	0.00	1.00
Distress day return	-0.35	0.21	-0.90	-0.33	-0.06

Panel D: Distress Event Sample Partioned by Business (N=118)

Variable	Mean	Std Dev	Min	Median	Max
Same_dummy	0.69	0.46	0.00	1.00	1.00
Bankrupt/distressed firm size ($ b.)	135	309	3	12	1707
Equity correlation	0.41	0.24	-0.12	0.46	0.88
Rival volatility	2.12	1.78	0.00	1.70	9.84
Rival rating	14.76	2.20	10.00	14.52	21.00
Industry Herfindahl index	0.14	0.16	0.01	0.09	0.79
Recession	0.45	0.50	0.00	0.00	1.00
Distress day return	-0.41	0.23	-0.90	-0.38	-0.08

Same_dummy is an indicator variable that equals 1 if the bankrupt or distressed firm and the industry portfolio are in the same state, both conduct real estate business, or are both in the same state and conduct real estate business, and 0 otherwise, Bankrupt/distressed firm size is total assets of the 'event' firm (its natural logarithm is used in in Table 8). Equity correlation is the correlation of equity returns between the 'event' firm and the industry portfolios for 252 days preceding the event. Rival volatility is the equity return volatility of the industry portfolio for the 252 days preceding the event. Rival rating is the average bond rating of the industry portfolio, where S&P ratings are obtained from Compustat and assigned a number, ranging from 1 for AAA, 2 for AA+, to 21 for C. Industry Herfindahl index is computed as the sum of the squared fractions of each individual firm's sales over total sales of the industry portfolio. Recession is an indicator variable based on NBER recessions. Distress day return is the equity return of the distressed firm on the 'event' day.

Table VIII

Cross-Sectional Analysis of Industry Portfolio' Abnormal Equity Returns

The dependent variable, CAR, is defined as the cumulative abnormal stock return for the portfolio of industry competitors over the [-2, 2] daily interval around the 'event' day from a market model. Other variables are defined in Table VII. Figures in parentheses are t-statistics based on clustered standard errors, which are robust standard errors adjusted for clustering by the 'event' firms. The superscripts ***, **, and * indicate significance at 1%, 5% and 10% levels, respectively.

		Bankruptcy Sample			**Distress Sample**		
	Expected Sign	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Constant		3.17	4.34	1.53	2.15	1.85	2.39
		(1.02)	(1.11)	(0.50)	(0.79)	(0.43)	(0.61)
Same_state	–	-2.13***			-1.85***		
		(-3.41)			(-2.66)		
Same_business	–		-1.36**			-2.38**	
			(-2.24)			(-2.26)	
Same_state_business	–			-1.94***			-3.16**
				(-2.72)			(-2.14)
Equity correlation	–	-4.95*	0.51	-6.98*	-2.73**	-5.19**	-3.45**
		(-1.65)	(0.16)	(-1.92)	(-2.14)	(-2.06)	(-2.09)
Bankrupt/distressed firm size	+/-	0.18	-0.24	0.21	0.17	0.21	0.30
		(1.02)	(-0.99)	(1.25)	(0.87)	(0.78)	(1.27)
Rival volatility	–	0.04	-0.20	0.19	0.30	-0.48	-0.55
		(0.11)	(-0.57)	(0.61)	(0.57)	(-0.78)	(-0.51)
Rival rating	–	-0.24	-0.07	-0.15	-0.30*	0.02	-0.28
		(-1.33)	(-0.28)	(-0.78)	(-1.65)	(0.08)	(-1.05)
Industry Herfindahl index	+	7.30**	-4.48	7.34**	-0.60	-5.36	-2.35
		(2.28)	(-0.85)	(2.33)	(-0.26)	(-1.38)	(-0.79)
Recession	–	-2.09***	-1.05	-2.20***	-0.37	-1.21	0.43
		(-2.74)	(-0.74)	(-2.82)	(-0.38)	(-1.15)	(0.25)
R-square adj. (%)		9.60	5.78	11.13	5.16	9.73	9.65
P-value for F-stat.		0.0025	0.0684	0.0213	0.0313	0.0470	0.0508
No. of Obs.		193	110	170	233	118	188

Table IX

Panel A: Exposures to Lehman Brothers Holding Inc. (in $ millions)

	No. of claims	Mean	Median	Max	Min	Total
All claims above $1 million	6,560	81.5	4.8	73,162.3	1.0	534,359.0
Claims made by trustees	678	510.8	4.9	73,162.3	1.0	346,288.2
Other claims	5,882	32.0	4.8	19,058.0	1.0	188,071.0

	No.	Mean	Median	Max	Min	Total
Claims owed to public creditors:	163	347.1	19.3	15800.0	0.5	54147.1
By type of creditor						
Nonfinancial creditors	53	64.9	6.4	920.0	0.7	3,439.3
Financial creditors	110	492.3	34.0	15,800.0	0.5	50,707.8
By type of claim						
Derivatives	38	162.9	7.9	2,500.0	1.0	6,189.5
Equity	5	11.8	5.8	32.0	1.0	59.2
Unsecured debt	80	79.5	15.5	920.0	0.5	6,356.4
Bonds and derivatives	40	1,258.9	127.0	15,800.0	1.2	41,542.0

	No.	Mean	Median	Max	Min	% (<1.5%)	t
Claim/assets (%) for public creditors:	163	1.8	0.1	90.4	0.0	87.2	0.4
By type of creditor							
Nonfinancial creditors	53	4.2	0.1	90.4	0.0	75.5	1.4
Financial creditors	110	0.5	0.2	13.8	0.0	93.2***	5.9
By type of claim							
Derivatives	38	1.3	0.1	13.8	0.0	81.6	0.4
Equity	5	0.6	0.2	2.0	0.1	80**	2.5
Unsecured debt	80	2.7	0.2	90.4	0.0	86.3	0.9
Bonds and derivatives	40	0.2	0.1	1.8	0.0	97***	21.9

	No.	Mean	Median	Max	Min	% (<15%)	t
Claim/equity (%) for public creditors:	163	4.8	0.9	83.6	0.0	93.6***	9.7
By type of creditor							
Nonfinancial creditors	53	5.1	0.1	83.6	0.0	92.5***	5.0
Financial creditors	110	4.7	1.1	75.7	0.0	94.2***	8.5
By type of claim							
Derivatives	38	4.4	0.2	60.8	0.0	92.1***	5.5
Equity	5	1.0	0.4	3.0	0.1	100***	26.4
Unsecured debt	80	5.0	0.9	83.6	0.0	93.8***	6.4
Bonds and derivatives	40	5.3	1.0	75.7	0.0	93.9***	4.2

Table IX

Panel B: Exposures to American International Group (in $ millions)

	No. of claims	Mean	Median	Max	Min	Total
Payments to financial firm creditors:	51	1,731	900	7,000	0	88,300
CDS	20	915	500	4,100	200	18,300
Maiden Lane III (CDO)	15	1,787	900	6,900	0	26,800
Securities lending	16	2,700	2,050	7,000	200	43,200
Payments to public financial companies	39	2,054	1,000	7,000	0	80,100
CDS	15	1,020	400	4,100	200	15,300
Maiden Lane III (CDO)	11	2,200	900	6,900	0	24,200
Securities lending	13	3,123	2,300	7,000	400	40,600
Payments by industry:	**No. of claimants**	**Mean**	**Median**	**Max**	**Min**	**Total**
6020	12	4167	2500	11900	200	50,000
6199	1	2300	2300	2300	2300	2,300
6211	4	5325	4000	12900	400	21,300
6282	1	5000	5000	5000	5000	5,000
6311	1	1500	1500	1500	1500	1,500
All	19	4216	2300	12900	200	80,100
Payments/ total assets (%) by industry	**No. of claimants**	**Mean**	**Median**	**Max**	**Min**	
6020	12	0.21	0.18	0.70	0.02	
6199	1	0.11	0.11	0.11	0.11	
6211	4	0.51	0.41	1.19	0.03	
6282	1	0.24	0.24	0.24	0.24	
6311	1	0.07	0.07	0.07	0.07	
All	19	0.26	0.17	1.19	0.02	
Payments / market value of equity (%) by industry	**No. of claimants**	**Mean**	**Median**	**Max**	**Min**	
6020	12	9.56	4.71	27.36	0.26	
6199	1	2.52	2.52	2.52	2.52	
6211	4	10.91	10.49	21.81	0.86	
6282	1	8.55	8.55	8.55	8.55	
6311	1	2.35	2.35	2.35	2.35	
All	19	8.98	4.52	27.36	0.26	

Table X

Panel A: Contagion Effect of Lehman's Distress on Unsecured Creditor's Stock Prices

The table presents abnormal equity returns (AR) and cumulative abnormal returns (CAR) for the portfolio of Lehman creditors around 6 major Lehman dates: March 14, 2008 (Bear Stearns collapse), June 2, 2008 (ratings cut by S&P), June 9, 2008 (posts $3 b. losses), August 19, 2008 (secret talks to sell 50% stake stall), September 11, 2008 (looking for buyers including BOA) and September 15, 2008(bankruptcy). The creditor portfolio return is constructed as a portfolio of equally-weighted equity returns of all publicly-listed unsecured creditors. We average these returns across events. Creditors with a high exposure/TA ratio (high exposure/equity ratio) are the creditors that have an exposure/TA ratio (exposure/equity ratio) above the median of the sample. AR (CAR) is the market-adjusted cumulative abnormal return (in percent) of the creditor portfolio, using the market model over the period (-250, -50). The market return is proxied by the CRSP value-weighted index. Statistical significance for ARs (CARs) is tested following MacKinlay (1997). The "% (<0)" entry indicates the percentage of observations with negative or zero values. The statistical significance for this fraction is based on a generalized sign test. The superscripts ***, **, and * indicate significance at 1%, 5% and 10% levels, respectively.

	All Creditors (N=163)			Financial Creditors (N=106)			Creditors with High Exposure/TA Ratio (N=81)			Creditors with High Exposure/Equity Ratio (N=81)		
Day	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-statistic**	**% (<0)**	**Mean (%)**	**T-statistic**	**% (<0)**
-2	-0.16	-0.56	50.0	-0.08	-0.21	50.0	-0.26	-0.58	50.0	-0.30	-0.66	50.0
-1	**-0.35****	-1.95	66.7**	**-0.73*****	-2.83	83.3***	**-0.63***	-1.68	83.3***	**-0.71***	-1.90	83.3***
0	**-0.77*****	-4.85	100.0***	**-0.98*****	-4.47	100.0***	**-0.94*****	-3.48	100.0***	**-1.09*****	-3.31	100.0***
1	**-0.47***	-1.70	66.7**	-0.47	-1.49	66.7**	**-0.93****	-2.21	66.7**	**-0.89****	-1.95	66.7**
2	-0.40	-1.36	83.3***	-0.46	-0.94	83.3***	**-0.56***	-1.67	83.3***	**-0.88****	-1.96	83.3***
0, 1	**-1.24*****	-3.33	83.3***	**-1.45*****	-3.13	83.3***	**-1.87*****	-3.17	83.3***	**-1.97*****	-2.77	83.3***
-1, 1	**-1.59*****	-3.77	100.0***	**-2.18*****	-3.67	100.0***	**-2.50*****	-2.95	100.0***	**-2.68*****	-2.78	100.0***
-2, 2	**-2.16*****	-2.94	83.3***	**-2.72*****	-3.02	100.0***	**-3.31*****	-2.79	100.0***	**-3.87*****	-2.68	100.0***

Panel B: Contagion Effect of AIG's Distress on Unsecured Creditor's Stock Prices

The table presents abnormal equity returns (AR) and cumulative abnormal returns (CAR) for the portfolio of AIG creditors on the following event dates: (1) earnings announcement dates with negative earnings surprises during 2007 to September 1, 2008; (2) events related to AIG in the St. Louis Federal Reserve's financial crisis timeline; and (3) two dates in Egginton et al. (2009) involving financial problems at AIG (February 11, 2008 and September 15, 2008). The creditor portfolio return is constructed as a portfolio of equally-weighted equity returns of AIG's publicly-traded unsecured creditors. We average these returns across events. AR (CAR) is the market-adjusted cumulative abnormal return (in percent) of the creditor portfolio, using the market model over the period (-250, -50). The market return is proxied by the CRSP value-weighted index. Statistical significance for ARs (CARs) is tested following MacKinlay (1997). The "% (<0)" entry indicates the percentage of observations with negative or zero values. The statistical significance of this fraction is based on a generalized sign test. The superscripts ***, **, and * indicate significance at 1%, 5% and 10% levels, respectively.

	6 Significant Negative Events before Bailout			Distress Day			Creditors with High Exposure/TA Ratio			Creditors with High Exposure/Equity Ratio		
Day	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-statistic**	**% (<0)**	**Mean (%)**	**T-statistic**	**% (<0)**
-2	-0.63	-1.16	66.7**	**-2.27*****	-3.77	92.9***	-0.78	-1.42	66.7**	-0.81	-1.35	66.7**
-1	-0.28	-0.69	66.7**	-0.53	-0.83	57.1	-0.18	-0.43	50.0	-0.35	-0.68	50.0
0	**-1.89*****	-4.43	100.0***	**-3.94*****	-3.22	85.7***	**-2.14*****	-4.10	100.0***	**-2.31*****	-3.39	100.0***
1	-0.45	-1.07	66.7**	-2.32	-1.34	57.1	**-0.61****	-2.28	83.3**	**-0.72*****	-2.93	100.0***
2	-0.99	-1.62	66.7**	**-3.90*****	-2.81	78.6***	**-0.76****	-1.69	66.7**	**-0.90***	-1.74	83.3**
0, 1	**-2.34*****	-2.86	100.0***	**-6.26*****	-3.21	85.7***	**-2.75*****	-3.73	100.0***	**-3.02*****	-3.59	100.0***
-1, 1	**-2.62*****	-2.92	100.0***	**-6.79*****	-3.09	64.3**	**-2.93*****	-3.41	100.0***	**-3.37*****	-3.23	100.0***
-2, 2	**-4.24****	-2.34	100.0***	**-12.96*****	-3.59	78.6***	**-4.47*****	-2.73	100.0***	**-5.08*****	-2.71	100.0***