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 on bank failures, summarized by Aharony and Swary (1996) and often using the case of one or a few major banks during the 1980s, also finds significant negative effects.

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, especially for financial firms, is less clear. Several studies of bank failures (e.g., Aharony and Swary (1996) and Wall and Peterson (1990)) focus on the idea that the event is a source of information about firm cash flows and thus it is important for valuing the stocks of other rival banks.[2] Such information-based explanations of contagion (information contagion) highlight the role of exposures to common factors among financial firms, whereas more recent studies of bank failures, such as Iyer and Pedro (2011), focus on the potential for contagion to occur through interbank linkages (counterparty contagion). With counterparty contagion, the collapse of one bank causes others to fall in domino-like fashion as the result of direct business ties (Allen and Gale (2000), Furfine (2003) and Upper and Worms (2004)). The counterparties could be bondholders or banks who provide capital to a financial institution or they could be clients, vendors, or dealers who are exposed as a result of other business contracts and who only become creditors upon a bankruptcy filing. Both counterparty contagion and information contagion could be important for interconnected financial firms, but few empirical studies consider both types of spillover effects.[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]Benzoni, Collin-Dufresne, Goldstein and Helwege (2012), Pirinsky and Wang (2006) and Veronesi (2000) also analyze how information flows from one firm's securities to another's.

[3] Two exceptions are Jorion and Zhang (2012) and Chakrabarty and Zhang (2012), who consider the failure of Lehman. Azizpour, Giesecke and Schwenkler (2014) isolate counterparty contagion from common shocks for a sample that includes nonfinancial firms.

In this paper we measure the effects of both counterparty contagion and information contagion on financial firms 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 financial 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 financial firm competitors with similar geographic exposures or that are also in real estate.

To separate the impacts on financial firms of information contagion and counterparty contagion, we also conduct event studies that evaluate the impact on financial firm counterparties. While information effects could reflect shocks that impact all financial firms, in the case of counterparty contagion the firms at the "epicenter" of the shock are those that lent money to the failed bank or were exposed to losses from financial market transactions such as CDS. Thus, if counterparty contagion is important for financial firms, an event study of the stocks of the bankrupt institution's counterparties 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 related of financial firms (see Jorion and Zhang (2009)) and from two other unique sources, the Epiq Systems debtorMatrix (which has data on Lehman Brothers) and Congressional testimony (which allows us to evaluate counterparty contagion related to American International Group (AIG)).

We evaluate financial firm contagion with a large sample of distressed and bankrupt 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 banks 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 in financial institution failures. The estimated impact is larger for rival banks in the same locale or the same line of business. Information contagion has a larger impact in cases of financial firm distress than in bankruptcies. These findings on information contagion may reflect TBTF policies and 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), Wagner (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 financial firms operating in the same business, as they are likely to hold similar assets and would suffer greater losses from fire sales. Similarly, financial 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) emphasize the potential for financial system fragility when shocks to individual banks are propagated from one bank to another through the interbank loan market (see also Acemoglu, Ozdaglar and Tahbaz-Salehi (2013) and Zawadowski (2012)). Similarly, Jarrow and Yu (2001), Davis and Lo (2001), Giesecke and Weber (2004, 2006), and Kraft and Steffensen (2007) model the impact on credit risk from contagion that occurs when the default of one firm creates losses for other firms. In these models of counterparty contagion, the propagation mechanism relies on direct business ties between firms. Frequently, they predict that the greater the number of exposed firms (i.e., the more complex the network), the greater the potential for financial system trouble. Likewise, greater exposures generate larger problems. Staum (2013) summarizes much of this theoretical literature.

Counterparty contagion could be limited to debtors and their lender, but the recent financial crisis, particularly the case of AIG, has brought attention to bilateral derivatives contracts as a source of systemic risk. Early studies on the pricing of derivatives (e.g., Cooper and Mello (1991)) considered the potential for counterparties to renege on their swap contracts, while more recent work has debated the desirability of trading CDS on an exchange (Duffie and Zhu (2012), Pirrong (2009), Cecchetti, Gyntelberg and Hollanders (2009), Hull (2010), Duffie, Scheicher and Vuillemey (2014), Arora, Gandhi and Longstaff (2012) and Acharya and Bisin (2014)).

While many researchers highlight the potential for the failure of a financial firm to impact the securities of other firms that have direct business ties with it, the availability of data limits the scope of empirical research on financial institution counterparty contagion. Studies that do not focus on financial firms have identified counterparty contagion by using data on supplier and customer relationships from SEC filings (e.g., Hertzel, Li, Officer and Rodgers (2008) and Kolay, Lemmon and Tashjian (2012)),

creditor claims in bankruptcy filings (Jorion and Zhang (2009)), and the timing of clustered defaults (Azizpour, Giesecke and Schwenkler (2014)), but studies of financial firm counterparties tend to focus on banks' exposures to other banks. Furfine (2003), Upper and Worms (2004), Boss, Elsinger, Summer and Thurner (2004) and Elsinger, Lehar and Summer (2006) analyze unique datasets of interbank loans, while Iyer and Pedro (2010), Karafiath and Glascock (1989) and the above-mentioned studies of Lehman's failure examine the failure of one bank. A common approach since the financial crisis is to measure systemic risk with correlation and other statistics, often implicitly assuming that such measures represent, at least in part, bilateral ties between financial institutions (e.g., Adrian and Brunnermeier (2010)).[4] Billio, Getmansky, Lo and Pelizzon (2012) and Drehmann and Tarashev (2013) conclude from their work that financial firm counterparty contagion plays an important role in systemic risk.

Studies of network fragility, systemic risk and counterparty risk imply that the largest impact of a financial firm bankruptcy filing would be felt on the firm's counterparties. Moreover, among the counterparties, those with the most negative valuation effects would be the ones with the largest (unsecured) claims. In contrast, firms with small claims or debts with low losses (collateralized debt) would be less affected.[5] The most extreme negative effect on a counterparty occurs when a financial firm bankruptcy filing causes losses that are so large that they drive its counterparty into insolvency, which in turn could cause a third bankruptcy or clusters of defaults (see Das, Duffie, Kapadia and Saita (2007), Duffie, Eckner, Horel and Saita (2009), Lando and Nielsen (2010) and Azizpour, Giesecke and Schwenkler (2014)). Thus, we consider the frequency of subsequent bankruptcies in hypothesis H1:

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

Counterparties may be affected through an increase in the probability of default without actually being forced into bankruptcy. Thus, we expect that their stock returns will be reduced upon the announcement of a financial firm 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:

[4] See also Acharya, Brownlees, Engle, Farazmand and Richardson (2010), Drehmann and Tarashev (2013), Huang, Zhang and Zhou (2009), Rochet (2010) and Suh (2011) on systemic risk.

[5] 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.

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 firm 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:[6]

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 banks in the same market or on financial firms that share similar characteristics.[7] Studies that focus on information contagion are common in studies of financial firm failures written before the subprime crisis (e.g., Fenn and Cole (1994), Fields, Klein, and Myskowski (1998), Aharony and Swary (1983, 1996), Wall and Peterson (1990), Dickinson, Peterson, and Christiansen (1991), and Fields, Ross, Ghosh, and Johnson (1994)). 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.[8] In addition, studies of failures and bailouts of large 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 of financial institution failure and information contagion do not control

[6] 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.

[7] 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).

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

for counterparty effects.[9] To separate out information effects from counterparty effects, we conduct an event study where we exclude the reactions of rival banks 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 financial 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 banks that operate in the same 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 financial 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 conduct two types of event studies: one with creditors of the bankrupt financial firm that allows us to estimate counterparty contagion and one with peer firms that allows us to estimate the impact of information contagion. Peer firms are defined as competitors that operate in the same 4-digit SIC code. When we form the sample of peer firms we eliminate all firms that they are also creditors of the troubled firm in order to avoid overstating information contagion that is really due to counterparty contagion effects. The event study methodology requires that we calculate the abnormal return (AR_{jt}) for each firm j on day t as follows:

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

[9] Exceptions include Jorion and Zhang (2012) and Chakrabarty and Zhang (2012), who analyze Lehman's bankruptcy.

where R_{jt} is the rate of return for firm 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). Because some of our samples are small, we report bootstrapped t-statistics. 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 the required accounting data for subsequent analysis.

b. Creditor data

We obtain data on the creditors of these bankrupt financial 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 at the time of the filing).[10] In addition, we obtain counterparties for AIG from Congressional testimony about the Federal Reserve's bailout of the company. There are six financial firms that are both creditors and rivals (defined below). In order to avoid contamination, we exclude these firms from both the creditor and rival CAR analyses.

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.[11] Using the approach in Hertzel, Li, Officer and Rodgers (2008), we define the distress date as the day when the firm's stock

[10]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).

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

price experiences the largest decline in the 3-year period.[12] 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 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%.[13]

d. Rivals

We identify rivals that may suffer from information contagion using Compustat's 4-digit industry codes.[14] 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 an indicator for 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).[15] 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

[12] 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.

[13] 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.

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

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

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 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. Nonetheless, the bankrupt firm sample includes 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 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.

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 II reports the absolute and relative sizes of the claims owed by the sample of the 88 financial firms that have data on creditor claims reported by the firm at the time of its bankruptcy filing. Panel A shows the aggregate value of the claims and the overall distribution of the debt and Panels B-F provide details on the counterparties that suffered losses from the 88 bankruptcies. The firms in Panel A 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.

Although trustees are typically among the largest unsecured creditors of a bankrupt firm (Jorion and Zhang (2009) and Helwege (2010)), their claims are aggregated across a number of investors and if included in the aggregate would severely overstate the potential loss of any one investor. 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.[16] 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, 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.[17] 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.

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 by another financial institution is as high as $2 billion

[16] 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.

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

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. Because of data availability, these figures are based on 62 of the 88 bankruptcies in Panel A of the table. The largest unsecured Lehman creditors are among these 62 firms' creditors, but here we do not include the additional data from Epic on 160 other Lehman creditors (their claims are analyzed separately later in Table 9). Panel C shows that the average and median unsecured claims for publicly traded firms 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 to 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.[18] 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.

[18] 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.[19]

The data in Panels A – F of Table II 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.[20] 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 II, AHM and AIG) have 287 publicly traded firms that are listed as their largest unsecured creditors and, thus, have the potential to 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.

[19] 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.

[20] We consider the exposures of two large firms (Lehman and AIG) as a robustness check in section 3d.

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 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.[21] 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 III, Panel A shows that creditors suffer significant losses as a result of the bankruptcies, with an average decline of slightly more than two percent (-2.29%, t=-4.37) 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 not large. Financial firm creditors, which are the majority of the creditors, experience slightly worse market reactions by some metrics (day 0, [-1,1], and [-2,2]), 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 extreme for the bankruptcies that occurred during 2007-2009. Panel B of Table IV shows that the [-2,2] window return is -2.90%, compared to -2.29% for the entire sample. In comparison, the return in the previous recession period of 1999-2002 is insignificant and only -0.71%. Panel B of Table III also reports the CARs according the industry of the bankrupt firm. Despite the focus on interbank lending as a source of contagion, we find that depository institutions have the least impact on other stocks. In contrast, the most negative reaction occurs with securities firms' bankruptcy, which has a [2,2] CAR of -3.95%. The analysis of counterparty contagion in Table III, Panel A is based on the stocks of 402 individual firms, of which 163 are Lehman creditors. This firm's creditors account for the larger impact of securities firms' bankruptcies as well as the larger impact for

[21] 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).

bankruptcies after 2007. Thus, the average impact may be somewhat overstated by the large number of Lehman creditors. Later, in the robustness section, we investigate an alternative method using portfolios that weights each bankrupt firm equally.

We consider multivariate analysis of creditor CARs in Table IV. Panel A presents summary statistics on the variables used in the regression while Panel B reports regression estimates. Data availability limits the sample here to 384 of the 402 creditors used in Table III, Panel A. Table IV shows that the exposure measured as a fraction of total assets averages 0.75%, which reflects the diversification of the creditor firms. The average creditor asset base is large, at about $341 billion, but the median is markedly smaller. 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 2.05% is fairly small, and the median is 6 basis points. The mean volatility is 2.90% and the mean equity correlation (available for only 314 creditors) is 0.20. About a quarter of the claims are related to derivatives. The average bankrupt firm has hundreds of millions of dollars in assets, but again the median size is much smaller. About one-fifth of the bankruptcies involve commercial banks.

Panel B of Table IV shows estimates from regressions that explain 5-day CARs (models (1), (3) and (4)) and 2-day CARs (models (2) and (5)). All regressions are estimated with industry and year clustering variables and all have p-values of .001 or smaller. Supporting H2, we find that firms with higher counterparty exposures have more negative CARs. In models (1) - (3), 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. The regressions in Panel B 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, 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 in the first three specifications. Leverage usually has the correct (negative) sign but it is not significant.

We do not find significantly different contagion effects for commercial bank creditors, except in model (5) where the positive coefficient on the commercial bank creditor dummy variable suggests a weaker effect. Weaker contagion effects may reflect diversification rules imposed on commercial banks. Certainly, there is no evidence in Table IV to indicate that interbank lending leads to greater counterparty contagion.

c. Information contagion and stock market returns of rivals

Next, we investigate information contagion with event studies related to the bankrupt firm's competitors. Panel A of Table V shows a modest negative effect on rivals upon the announcement of a financial firm bankruptcy filing. For the 142 bankruptcies, the typical reaction of rival firms is about a half a percent and slightly more than half of the firms have a negative stock price reaction.

There are thousands of commercial banks with the same 4-digit SIC code, but they often operate in vastly different geographic markets and may not be affected much by the bankruptcy of a bank in a different part of the country. To identify the firms for which information from a bankruptcy or distress event will be most relevant, we consider firms that operate in the same state (and, therefore, which are more likely to be exposed to common regional factors). Table V shows that the impact is larger for these 912 firms than the sample overall. The day [0, 1] impact is -0.59% (t-statistic of -2.71) for these 96 bankruptcies, which is nearly double the impact for the sample as a whole. The CARs for longer windows are also significantly negative and greater in absolute value. In Panel B of Table V, we find that the results for competitors in the same state are more negative when the bankrupt firm is in the securities industry, while depository institutions (the industry that accounts for most of the rivals) have a reaction that is similar to that of the whole sample. The subsample analysis reveals that the most recent financial crisis does not have more extreme information effects than other periods.

Information contagion may also be more apparent among competitors that are also focused on real estate. The third column to the right in Panel A of Table V shows the impact of the 89 bankruptcies involving RE firms. Their 11,677 rivals exhibit significant negative stock market reactions as well. The returns over the [0, 1] and [-1, 1] windows are similar to those for the whole sample, but the longer windows are more negative. In Panel B of Table V we show that the majority of these rivals are from the 2007-2010 period, but the most negative impact does not come from the recent financial crisis. Securities firms have a particularly negative impact on rivals, but the average is not significant (although a sign test indicates their bankruptcies matter the most). Banks (depository institutions) account for the largest group of rivals and their impact is significantly negative by both the t-test and the sign test.

In Panel A of Table V, we narrow the set of competitors down further, by requiring both similar geographic markets and a focus on real estate. The estimates are somewhat more negative (the [-2, 2] window CAR is -1.19%) than for the same business rivals or same state rivals alone, although some point estimates suggest otherwise.

Information contagion may not be very 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)). Although the excess return on day 0 and over short windows are similar to those for the bankruptcy event CARs, the reaction of rivals is noticeably more negative over the [-2,2] window (-0.743%) and the [-5,5] window. 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 [-2, 2] CAR is -2.06%). In Panel B of Table VI, we examine the [-2, 2] CARs for same state rivals in various time periods and by industry of the distressed firm. The effects on rivals in the 1999-2002 period are not as negative as in the other periods, which all average about around -2%. The impact is similar across all the industries, except for the securities industry, which is slightly positive and insignificant.

Our sample of distressed firms includes 82 financial institutions that suffered from RE losses. Panel A of Table VI shows that their peers also exhibit stronger information spillover effects than the rival firms as a whole. For example, the [-2, 2] CAR averages -1.49%, or about double that of the sample average. In Panel B of Table VI we find that the 1999-2002 period is the only period with insignificant [-2, 2] CARs. Insurance companies cause the greatest information contagion by far ([-2,2] CAR equal to -5.06%), although they only account for 48 of the 7,405 rivals in RE. Securities industry cases of distress again are insignificantly different from zero.

Finally, we consider the CARs of rivals that are in the same state and same business (Panel A of Table VI). When we restrict the rival firms to include those competitors in the same state and the same line of business, the day [0, 1] CAR is -1.45% and the CARs over the longest windows are sharply lower. Taken together, the results in Tables V and VI suggest that other financial firms in the industry suffer

from significant 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 multivariate regressions of the rival firms' CARs. For each type of event, bankruptcy or distress, we include indicator variables for rivals that 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 Panel A of Table VII.

Panel B of Table VII shows that rival stocks react more negatively to the news of a bankruptcy or distress when they are located in the same state or when both firms are in the real estate business. We do not find that the combination of being in the same state and same business adds any explanatory power, but this group is also fairly small. Similar firms, as measured by the equity correlations, also suffer more from these events, particularly in the bankruptcy sample. Finally, the regressions do not indicate that there are positive competitive effects - the Herfindahl measure is insignificant in all regressions.

d. Case Studies of Lehman and AIG

Many of the bankruptcies in the sample involve smaller financial 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.[22] Panel A of Table VIII shows creditor exposures for Lehman. Note the largest claim by a publicly traded creditor in Table VIII is larger than the largest comparable claim in Table II, even though Table II 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.[23] We discuss the derivatives in more

[22] There are more than 6,500 claims for Lehman, which we obtain from the Epiq. In contrast, the data in Table II (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.

[23]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.

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 II. 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.

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.[24] 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.[25] 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 VIII 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%.[26] 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%

[24]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.

[25]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.

[26] 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.

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.[27] 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 II). This 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 II. 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.[28]

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 VIII shows that the majority of the exposures

[27] 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.

[28] 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.

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 Table III 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 IX 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 (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).[29]

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 similar to those of the full sample reported in Panel A of Table III. The stock returns of Lehman's creditors fall by 1.24% on average over [0, 1] with a t-statistic of -6.31. 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%. Most of the creditors are financial firm creditors and their stocks react more negatively than the creditor group as a whole, despite the fact that Panel A of Table VIII shows that nearly all of their claims are less than 1.5% of assets. The mean exposure as a fraction of equity is 4.7% and the loss given default is not 100%, so in comparison the declines in the counterparties' market values are high. This 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 IX 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

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

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.[30] 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 used by Lang and Stulz (1992) is to examine portfolio returns rather than individual creditor or rival stock returns. As a robustness check of Table III, we form portfolios of creditors rather than treating each creditor firm separately and we calculate the AR and CAR for the portfolio. In unreported results, we find that this approach yields similar estimates of counterparty contagion, although the effects are slightly smaller. For example, rather than an average return of -2.29 over the [-2, 2] event window, the return is -1.05% (t=-2.167) and if we restrict the sample to financial creditors the portfolio CAR over the three day window is -1.31% (t=-2.33) and the five day window CAR is insignificant. Since 163 of the 402 creditors belong to Lehman, and Lehman's impact was shown to be significant in Table IX, the difference between the individual and portfolio approaches owes in part to the fact that Lehman is weighted less heavily in the portfolio event study.

We also examine portfolio returns to test information contagion. In these event studies, the portfolio returns are less often significant but the magnitude when significant is typically a bit more negative. For example, the same state portfolio reaction to bankruptcy filings is -1.59% (t=-2.35), whereas in Table IV it is -.91%. Using the portfolio approach, we do not find information contagion in the full sample of bankruptcy filings, but rival reactions are significantly negative when we restrict the sample to bankruptcies in the same state or business. 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

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

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.[31] 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.[32] 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 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

[31] 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.

[32] 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.

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 financial 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

The sample is from 1981 to 2010 and includes financial firm bankrupties and distress events for firms with 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
Debt Owed to Unsecured Creditors

Debt owed to unsecured creditors is the amount listed in bankruptcy petitions from bankruptcydata.com. Trustees are identified as such in the petition. Commercial bank creditors are firms in SIC 6020. Publicly-listed creditors are those with data on Compustat.

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 III

Panel A: Counterparty Contagion and Creditor Stock Returns

Abnormal equity returns (AR) and cumulative abnormal returns (CAR) are calculated for the individual creditors (402 creditors for 62 bankruptcy events) around day 0, the date when a firm filed for Chapter 11 bankruptcy. 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 CAR (N=402)			Financial Creditor CAR (N=261)		
Day	**Mean (%)**	**T-statistic**	**% (<0)**	**Mean (%)**	**T-statistic**	**% (<0)**
-5	0.58**	3.64	43.6	0.94***	4.74	39.5
-4	-0.06	-0.34	48.7	-0.13	-0.72	50.2
-3	-0.48**	-2.45	50.5	-0.77***	-2.87	51.0
-2	-0.60***	-3.56	57.8***	-0.63***	-2.99	61.8***
-1	-0.51***	-3.07	54.0	-0.86***	-3.98	58.9***
0	-0.36*	-1.91	50.4	-0.47*	-1.90	53.1
1	-0.28	-1.11	48.1	0.06	0.17	41.7
2	-0.55***	-2.66	57.9***	-0.54**	-2.43	61.7***
3	1.11***	3.71	46.8	1.70***	3.93	42.5
4	1.12***	3.20	42.8	1.66***	3.28	43.5
5	-0.23	-0.69	57.5***	-0.84*	-1.94	65.7**
0, 1	-0.64*	-1.78	50.8	-0.42	-0.90	49.4
-1, 1	-1.14***	-2.77	51.2	-1.27**	-2.28	52.5
-2, 2	-2.29***	-4.37	58.0***	-2.43***	-3.70	59.8***
-5, 5	-0.21	-0.33	50.5	0.11	0.14	52.5

Table III

Panel B: Subsample Analysis

	Creditor CAR (Day -2,2)			
	N	**Mean (%)**	**T-stat.**	**% (<0)**
Period:				
1999-2002	77	**-0.71**	-1.15	54.5
2007-2010	295	**-2.90*** **	-4.20	58.9***
Other years	30	**-0.38**	-0.62	56.7
Industry:				
Depository institutions	21	**0.04**	0.04	61.9
Non-depository credit institutions	89	**-1.21** **	-1.96	57.3**
Real estate	78	**-2.05***	-1.65	50.0
Insurance companies	51	**-0.23**	-0.23	51.0
Securities firms	163	**-3.95*** **	-3.82	63.8***

Table IV

Panel A: Summary Statistics for Cross-Section Regression Variables

The sample includes 384 creditors with exposure data. 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 is available for 314 firms with returns 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. Commercial bank is a dummy variable if the failed firm is a commerical bank.

Variable	Mean	Std Dev	Min	Median	Max
Creditor characteristics:					
Exposure (% assets)	0.75	5.47	0.00	0.01	90.40
Exposure (% equity)	2.05	8.64	0.00	0.06	83.60
Size ($ b.)	341.44	601.58	0.03	43.51	3771.20
Leverage	0.68	0.28	0.00	0.80	0.99
Volatility	2.90	1.71	0.66	2.56	12.36
Claims are derivatives	0.24	0.43	0.00	0.00	1.00
Equity correlation with the bankrupt firm	0.20	0.40	0.00	0.00	1.00
Bankruptcy characteristics:					
Bankruptcy size ($ b.)	287.80	332.57	0.00	18.83	691.06
Commerical bank	0.21	0.41	0.00	0.00	1.00

Table IV

Panel B: 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. Year cluster dummies and industry cluster dummies used. The superscripts ***,**, and * indicate significance at 1%, 5% and 10% levels, respectively.

	Expected Sign	Model 1	Model 2	Model 3	Model 4	Model 5
		Day [-2, 2]	Day [0, 1]	Day [-2, 2]	Day [-2, 2]	Day [0, 1]
Constant		1.61	2.06	-4.79	-0.60	-0.32
		(0.48)	(1.02)	(-1.30)	(-0.22)	(-0.20)
Exposure (% of assets)	–	-0.06***	-0.21***	-0.04**		
		(-3.14)	(-12.49)	(-2.03)		
Exposure (% of equity)	–				-0.07***	-0.16***
					(-3.77)	(-6.91)
Size of bankrupt firm	–	0.07	0.13	0.03	0.15	0.23
		(0.26)	(0.72)	(0.17)	(0.66)	(1.51)
Size of creditor	+/–	0.01	-0.28	-0.03	0.09	-0.23
		(0.03)	(-1.64)	(-0.15)	(0.45)	(-1.40)
Derivatives claim	–	-3.66***	-4.41***	-3.07***	-3.03***	-3.43***
		(-5.81)	(-6.00)	(-6.04)	(-6.01)	(-4.53)
Derivatives claim * Exposure (% assets or equity)	–	-1.40***	-1.20***	-1.40***	-0.48***	-0.47***
		(-19.37)	(-17.09)	(-19.32)	(-13.01)	(-15.79)
Leverage	–	-2.70	-0.53	-3.01	-1.36	1.58
		(-1.39)	(-0.40)	(-1.30)	(-0.87)	(1.13)
Volatility	–	-0.91**	-0.89***	-1.03***	-0.29	-0.19
		(-2.41)	(-2.84)	(-4.00)	(-0.85)	(-0.92)
Equity correlation	+/–			2.63*		
				(1.73)		
Commercial bank creditor	+	2.58	2.41	3.25	2.02	1.71*
		(1.11)	(1.59)	(1.11)	(0.98)	(1.66)
R-square adj. (%)		9.47	17.41	12.65	14.34	29.69
No. of Obs.		384	384	314	384	384

Table V

Bankruptcy Filings and Information Contagion

The table presents abnormal equity returns (AR) and cumulative abnormal returns (CAR) for other firms in the same 4-digit SIC industry when a bankruptcy is announced. "Same state rivals" are firms with headquarters in the same state. "Same business rivals" are firms that are in real estate and the bankruptcy event involves losses in real estate. AR (CAR) is the market-adjusted cumulative abnormal return (in percent), 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.

Panel A: Full Sample

	All Industry Rivals			**Same State Rivals**			**Same Business Rivals**			**Same State and Same Business**		
	N=15,423 (142 Events)			**N=912 (96 Events)**			**N=11,677 (89 Events)**			**N=582 (57 Events)**		
Day	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**
-5	-0.03	-0.78	53.0	-0.14	-1.04	54.3	-0.17***	-4.56	54.7***	-0.35**	-2.22	57.2**
-4	-0.07*	-1.93	53.9***	-0.25	-1.73	54.1	-0.07*	-1.68	53.7***	-0.08	-0.41	54.3
-3	0.01	0.29	53.0	0.32	1.79	51.7	0.01	0.14	53.0*	0.33	1.45	50.6
-2	-0.02	-0.55	53.0	-0.12	-0.81	52.7	-0.08	-1.63	52.9	-0.25	-1.55	52.0
-1	-0.01	-0.23	52.9	-0.16	-1.14	52.1	0.02	0.55	52.0	-0.12	-0.87	51.0
0	0.06	1.38	54.4	-0.12	-0.74	54.2*	-0.12***	-3.14	54.9***	-0.15	-0.87	52.2
1	-0.41***	-10.53	57.3***	-0.47	-2.90	55.4*	-0.29***	-6.94	56.7***	-0.35	-1.60	55.7
2	-0.10**	-2.46	54.7***	-0.05	-0.28	55.4	-0.30***	-6.84	56.3***	-0.47***	-2.60	58.6***
3	0.09***	2.55	52.0	0.32	2.07	51.2	-0.01	-0.23	52.2	0.48***	2.96	46.7
4	-0.08**	-1.98	53.4***	0.03	0.19	53.3	-0.28***	-6.74	54.9***	-0.18	-1.08	54.7
5	0.12***	3.23	49.9	-0.09	-0.68	52.7	0.19***	4.32	48.7***	-0.07	-0.47	51.6
0, 1	**-0.36*** **	-7.15	56.4***	**-0.59*** **	-2.71	56.1**	**-0.41** **	-7.83	56.9***	**-0.46***	-1.85	55.2
-1, 1	**-0.37*** **	-6.31	55.4***	**-0.75*** **	-2.91	53.6	**-0.38*** **	-6.28	54.8***	**-0.58*** **	-2.09	51.9
-2, 2	**-0.48*** **	-6.60	55.0***	**-0.91*** **	-3.05	53.8	**-0.74*** **	-9.10	56.2***	**-1.19*** **	-3.53	52.7
-5, 5	**-0.44*** **	-4.57	54.6***	**-0.71***	-1.76	56.1**	**-1.08*** **	-10.21	56.7***	**-1.06** **	-2.23	56.0*

Table V

Panel B: Subsample Analysis

	Same State Rivals				Same Business Rivals			
	Rival CAR (Day -2,2)				Rival CAR (Day -2,2)			
	N	Mean (%)	T-stat.	% (<0)	N	Mean (%)	T-stat.	% (<0)
Period:								
1988-1991	101	-1.06*	-1.71	58.4	766	-0.19	-1.54	50.2
1999-2002	32	-1.24	-0.98	48.4	210	-0.85	-1.81	67.0***
2007-2010	630	-0.86**	-2.12	52.2	10,273	-0.72***	-8.13	56.1***
Other years	149	-0.95**	-2.45	58.4	428	-2.15***	-5.77	64.0***
Industry:								
Depository institutions	550	-0.84*	-1.94	54.0	9,752	-0.85***	-9.5	57.5***
Non-depository credit institutions	18	-2.78*	-1.68	70.6**	58	-0.37	-0.2	44.4
Real estate	211	-0.13	-0.33	48.8	1,739	-0.03	-0.2	47.7
Insurance companies	57	-1.63	-1.54	54.4	62	-1.31	-1.4	61.5
Securities firms	76	-2.60**	-2.67	61.8**	66	-2.87	-1.4	68.0*

Table VI

Distress Days and Information Contagion

The table presents abnormal equity returns (ARs) and cumulative abnormal returns (CARs) of industry rivals (same 4-digit SIC code) on the day a distressed firm experiences its largest single-day price decline over the period 1982-2010. Same state and same business rivals are defined in Table IV. AR (CAR) is the abnormal (cumulative abnormal) return (in percent) 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.

Panel A: Full Sample

	All Industry Rivals			**Same State Rivals**			**Same Business Rivals**			**Same State and Same Business**		
	N=14,840 (149 Events)			**N=533 (84 Events)**			**N=7,405 (82 Events)**			**N=197 (38 Events)**		
Day	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**	**Mean (%)**	**T-stat.**	**% <0**
-5	-0.26***	-7.36	53.8***	-0.07	-0.36	51.3	-0.38***	-6.89	54.8***	-0.43	-1.51	54.9
-4	-0.19***	-5.88	52.4	-0.06	-0.30	51.9	-0.45***	-8.81	55.6***	-0.78**	-2.14	60.0**
-3	-0.05	-1.39	51.7	0.14	0.80	48.9	0.00	0.05	49.6	0.20	0.73	44.1**
-2	-0.47***	-13.48	57.2***	-0.94***	-5.55	60.4***	-0.75***	-13.38	60.9***	-0.69**	-2.50	61.9***
-1	0.04	1.15	50.2	-0.14	-0.76	53.2	0.24***	3.35	47.9***	0.00	0.01	48.9
0	-0.33***	-8.44	53.5***	-0.78***	-2.89	55.3	-0.76***	-11.16	56.4***	-1.45***	-3.14	58.1*
1	-0.07*	-1.80	51.4	-0.23	-0.93	50.0	-0.25***	-3.69	52.0	-0.06	-0.19	47.6
2	-0.05	-1.17	52.3	-0.16	-0.60	57.6**	-0.11	-1.55	53.2**	-0.68	-1.32	58.7**
3	0.02	0.41	51.2	-0.08	-0.44	55.1	-0.15**	-2.51	52.6	-0.47	-1.39	59.2**
4	0.04	1.04	51.1	-0.17	-0.76	53.7	0.23***	3.51	49.4	0.08	0.19	50.8
5	0.02	0.41	52.0	-0.40**	-2.15	57.8**	-0.26***	-3.88	55.8***	-1.16***	-3.23	62.8***
0, 1	**-0.38*** **	-8.36	52.8***	**-0.97*** **	-3.09	54.9	**-0.96*** **	-12.19	55.7***	**-1.45** **	-2.59	56.0
-1, 1	**-0.34*** **	-6.36	51.9	**-1.09*** **	-3.08	52.6	**-0.73*** **	-7.57	53.4***	**-1.44** **	-2.18	52.1
-2, 2	**-0.75*** **	-11.77	54.4***	**-2.06*** **	-5.13	58.3***	**-1.49*** **	-12.75	57.4***	**-2.72*** **	-3.42	58.6**
-5, 5	**-1.12*** **	-12.30	54.3***	**-2.61*** **	-4.48	56.7**	**-2.38*** **	-14.73	57.9***	**-4.93*** **	-4.66	60.4**

Table VI

Panel B: Subsample Analysis

	Same State Rivals				Same Business Rivals			
	Rival CAR (Day -2,2)				Rival CAR (Day -2,2)			
	N	Mean (%)	T-stat.	% (<0)	N	Mean (%)	T-stat.	% (<0)
Period:								
1988-1991	38	-2.13***	-2.90	69.7**	528	-0.89***	-3.73	56.7**
1999-2002	115	-0.65*	-1.67	50.4	882	-0.13	-0.98	53.5
2007-2010	276	-2.78***	-3.87	59.1**	4686	-1.90***	-10.79	57.5***
Other years	104	-1.68***	-3.37	61.5**	1309	-1.18***	-7.66	59.9***
Industry:								
Depository institutions	289	-2.31***	-4.19	59.2**	5354	-1.53***	-11.22	57.7***
Non-depository credit institutions	12	-2.40***	-3.27	87.5**	69	-1.85*	-1.76	67.9
Real estate	168	-1.75**	-2.39	57.5*	1882	-1.26***	-5.45	55.8***
Insurance companies	38	-2.86*	-1.83	52.6	48	-5.06***	-3.19	71.7***
Securities firms	26	0.06	0.05	53.8	52	-1.92	-0.95	59.1

Table VII

Summary Statistics for Cross-Section Regression Variables

Same state indicator equals 1 if the bankrupt or distressed firm and the industry rival are in the same state. Same business indicator equals 1 if the bankrupt or distressed firm has real estate problems and the industry rival is also in the real estate business; and 0 otherwise. Same state & business indicator equals 1 if the bankrupt or distressed firm and the industry rival are both in the same state and both are in real estate; and 0 otherwise. Equity correlation is the correlation of equity returns between the 'event' firm and the industry rival's stock over the 252 days preceding the event. Volatility is the equity return volatility of the industry rival over the 252 days preceding the event. Rating is the average bond rating of the rival, where S&P ratings are obtained from Compustat and assigned a number, ranging from 1 for AAA, 2 for AA+, to 21 for C. Bankrupt/distressed firm size is total assets of the event firm (its natural logarithm is used in the regression). Industry Herfindahl index is computed as the sum of the squared fractions of each individual firm's sales over total sales of the industry. Distress day return is the equity return of the distressed firm on the event day.

Panel A: Bankruptcy Event Sample (N=14,557)

Variable	Mean	Std Dev	Min	Median	Max
Rival characteristics:					
Same state indicator	0.059	0.236	0.000	0.000	1.000
Same business indicator	0.594	0.495	0.000	1.000	1.000
Same state & business indicator	0.030	0.167	0.000	0.000	1.000
Equity correlation with the failed firm	0.06	0.10	-0.25	0.06	1.00
Volatility	4.24	2.82	0.01	3.57	42.89
Rating	14.0	3.4	5.0	14.0	23.0
Bankrupt firm characteristics:					
Size ($ b.)	2.6	5.3	0.0	0.6	691.0
Industry Herfindahl index	0.06	0.08	0.02	0.03	0.83

Panel B: Distress Event Sample (N=14,395)

Variable	Mean	Std Dev	Min	Median	Max
Rival characteristics:					
Same state indicator	0.036	0.186	0.000	0.000	1.000
Same business indicator	0.482	0.500	0.000	0.000	1.000
Same state & business indicator	0.030	0.167	0.000	0.000	1.000
Equity correlation with the failed firm	0.20	0.23	-0.31	0.12	0.87
Volatility	3.02	1.89	0.00	2.45	36.29
Rating	13.5	4.3	5.0	14.0	23.0
Bankrupt firm characteristics:					
Size ($ b.)	64.2	233.4	3.4	12.8	1706.8
Industry Herfindahl index	0.05	0.06	0.01	0.03	0.79
Distress day return	-0.34	0.20	-0.90	-0.33	-0.06

Table VII

Panel C: Regression Explaining Rivals' Abnormal Equity Returns

The dependent variable, CAR, is defined as the cumulative abnormal stock return of an industry competitors over the [-2, 2] daily interval around the event day from a market model. Other variables are defined in Table VI. 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 (N=14,557)			**Distress Sample (N=14,395)**		
	Expected Sign	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Constant		-1.04	-0.90	-0.91	-0.44	-0.01	-0.01
		(-0.92)	(-0.80)	(-0.80)	(-0.12)	(-0.01)	(-0.01)
Same_state	–	-0.69*	-0.70*	-0.72	-1.18**	-1.13**	-0.68
		(-1.84)	(-1.89)	(-1.61)	(-2.49)	(-2.43)	(-1.01)
Same_business	–		-0.83*	-0.82*		-1.28*	-1.26*
			(-1.79)	(-1.79)		(-1.92)	(-1.89)
Same_state_business	–			0.02			-0.73
				(0.03)			(-0.80)
Equity correlation	–	-2.42*	-2.32*	-2.32*	-1.32*	-0.95	-0.95
		(-1.90)	(-1.84)	(-1.85)	(-1.70)	(-1.27)	(-1.27)
Bankrupt/distressed firm size	+/-	-0.05	-0.01	-0.01	0.07	0.12	0.12
		(-0.60)	(-0.14)	(-0.14)	(0.16)	(0.31)	(0.31)
Rival volatility	–	-0.06	-0.04	-0.04	-0.17	-0.15	-0.15
		(-0.71)	(-0.52)	(-0.52)	(-1.37)	(-1.28)	(-1.28)
Rival rating	–	0.05*	0.04	0.04	-0.02	-0.01	-0.01
		(1.66)	(1.50)	(1.50)	(-0.85)	(-0.77)	(-0.78)
Industry Herfindahl index	+	-0.09	-0.19	-0.19	-3.61	-2.84	-2.82
		(-0.05)	(-0.10)	(-0.10)	(-1.23)	(-0.98)	(-0.97)
Year cluster dummy		yes	yes	yes	yes	yes	yes
Industry cluster dummy		yes	yes	yes	yes	yes	yes
R-square adj. (%)		0.48	0.69	0.68	0.48	0.98	0.99
P-value for F-stat.		0.007	0.01	0.0130	0.0288	0.0183	0.0251

Table VIII

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 VIII

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 IX

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***